FEASIBILITY REPORT

FOR

PROTOTYPE PLANS

FOR A

MULTI-STORY MANUFACTURING PLANT

IN THE

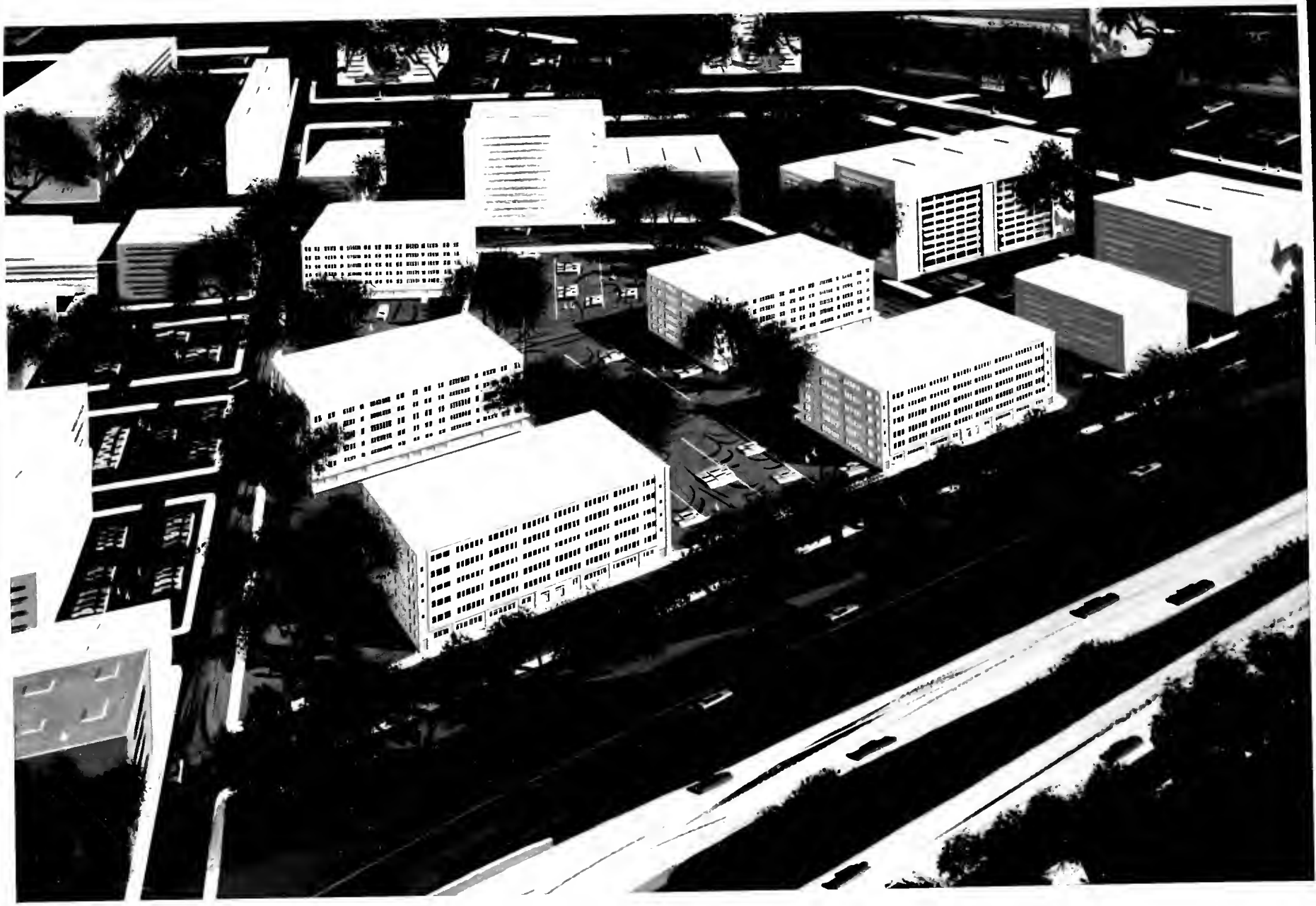
SOUTH END URBAN RENEWAL AREA

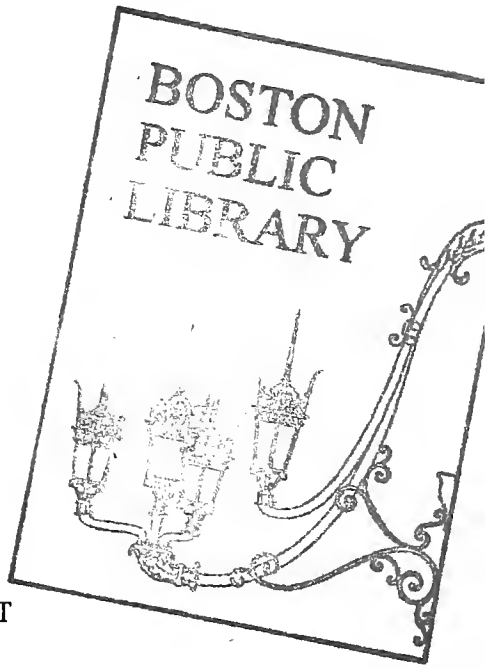
FOR THE

BOSTON REDEVELOPMENT AUTHORITY

JUNE 1966


BROWN INC.
J B CO-E's
FALMOUTH
H C ELECTRIC CO.
PEPPERIDGE
FISHER CO
ZENITH
TIMEX
BLUE RAY
JANTZEN
DICKER
GOE and YOUNG





FEASIBILITY REPORT

for

PROTOTYPE PLANS

for a

MULTI-STORY MANUFACTURING PLANT

in the

SOUTH END URBAN RENEWAL AREA

for the

BOSTON REDEVELOPMENT AUTHORITY

W. CHESTER BROWNE AND ASSOCIATES, INC.
Architects and Engineers
122-128 Arlington Street
Boston, Massachusetts

JUNE 1966

INTRODUCTION

This report presents a study and collection of analytic data relative to the feasibility of multi-story buildings for industrial use and low rental lease in the South End Urban Renewal Area.

It has been formulated, step by step, in co-ordination with the Boston Redevelopment Authority and in consultation with responsible developers, builders, financial institutions and insurance companies.

It has been revised and re-checked to conform with the most recent findings and operating practice and represents a synthesis of fact and reliable opinion, all calculated to determine the practicality of a prototype industrial building facility.

The report consists of nine parts as indexed on the following page and the subject matter includes analysis of design requirements, cost data for the prototype, comments regarding sites, transportation facilities, financial aspects of the program and finally, justification, reasoning and opinions of consultants.

INDEX

FEASIBILITY STUDY
for
PROTOTYPE PLANS
for a
MULTI-STORY LIGHT MANUFACTURING PLANT
in the
SOUTH END URBAN RENEWAL AREA
in the
CITY OF BOSTON

PART I - REQUIREMENTS AND PLANNING

Basic Requirement

The basic requirement of this study is to clearly demonstrate to the Boston Redevelopment Authority and to substantial private developers the feasibility of multi-story industrial buildings for lease at the lowest possible rentals in the South End Urban Renewal Area. The study is intended to develop a prototype multi-story building of low cost combined with maximum architectural quality and appearance for light industrial purposes by the use of drawings, specifications, analyses and cost data.

Scope of Study

There are numerous inherent problems which must be carefully analyzed by the designer in order to produce a multi-story prototype for industrial use with maximum flexibility that will meet the functional requirements of a wide variety of prospective tenants. These various problems are thoroughly discussed in the report. The prototype must be of sound architectural and structural quality. In order to be economically feasible, it must be created at a cost which will permit rental of leased areas at a price which is competitive with existing available in-town properties, yet offers adequate facilities which these existing facilities lack.

To fulfill the requirements of this study, the text is divided into ten parts, each of which is an important facet of the overall scope.

PART II - RECOMMENDATION OF SITES IN THE PROJECT AREA FOR PROTOTYPE STUDIES

Site Locations

The Boston Redevelopment Authority has given the designer a copy of a map developed by them entitled "South End Urban Renewal Area." Certain sites in the project area are designated as Industrial. One of these sites is located in the Castle Square area, another is located adjacent to the Roxbury area and the third which is a smaller site is located adjacent to the Fitzgerald Expressway a few blocks south of Dover Street.

Castle Square Site

The Castle Square site is bounded by Dover Street, Tremont Street, Herald Street and Washington Street. Shawmut Avenue divides the site in a north-southerly direction about 300 feet from Washington Street. Holy Trinity Church which is located in the latter block and an existing industrial installation at the corner of Herald Street and Shawmut Avenue are not slated for demolition. Two industrial installations are indicated in this block, fronting on Washington Street for a distance of approximately 700 feet from Herald Street and approximately 100 feet in depth. The remainder of this block is allocated to housing and a shopping center.

The plan indicates that a block bounded by Dover Street on the south, Tremont Street on the west, Herald Street on the north and Shawmut Avenue on the east be allocated to housing and industry. The industrial installation is to occupy a triangular portion of the block at the corner of Tremont Street and Herald Street. The block is about 960 feet in the north-south direction and 800 feet in the east-west direction.

Herald Street forms the east-west leg of the triangular portion allocated to the industrial installation for a distance of about 560 feet from Tremont Street and the north-south leg is formed by Tremont Street for a distance of about 560 feet. A portion of the block at the corner of Herald Street and Shawmut Avenue, approximately 200 feet by 160 feet is allocated to a parking garage.

The Site Adjacent to Roxbury

The industrial site adjacent to the Roxbury area is bounded on the west by Tremont Street, on the north by Hammond Street, on the east by Westminster Street, and on the south by Sterling Street. Another map entitled "Downtown Boston" prepared by the Transportation Division of the Boston Redevelopment Authority and dated December 1961 indicates that the proposed inner belt which is an extension of the present John F. Fitzgerald Expressway toward the westerly portion of the City may be located along the south boundary of this industrial site, adjacent to and south of Sterling Street.

This site is about 750 feet in the east-west direction and about 550 feet in the north-south direction. The opposite side of Hammond Street on the north is designated as housing. The opposite side of Westminster Street on the east is designated as housing.

Review of Locations

We have reviewed the locations of the various selected sites with responsible potential developers and financiers and have thoroughly discussed with them the advantages and disadvantages of the locations, physical shape of the sites, accessibility to throughways, opportunity for expansion and the effect of industrial installations adjacent to housing areas.

The consensus of their opinion is that a concentration of industrial installations adjacent to the Fitzgerald Expressway and completely divorced from housing is a wiser approach to the problem. All agreed that the best solution would be to extend the area allocated to industry from Dover Street south as far as possible between Harrison Avenue and the Fitzgerald Expressway, eliminating the smaller streets such as Bristol, Thayer, and Randolph Streets. Such a solution would create an area of substantial size for development to suit various tenants. Circulation through this area would be correlated with the installations, off-street parking and truck dock areas.

Flexibility

The developer should be given every opportunity to meet the requirements of the tenant, to transfer title for sites without encumberances and offer flexibility in financial arrangements. Buildings in the development could be erected by either the developer or site purchaser and could be either one story or multi-story buildings.

Commercial Area Considerations

The westerly side of Harrison Avenue would be allocated to commercial installations, including some recreational facility such as a bowling establishment and possibly a motel. This commercial installation would serve as a buffer between the industrial area and the housing area to the west. Direct ingress and egress from the industrial area to the adjacent Fitzgerald Expressway which would expedite truck delivery and shipping and would also minimize truck circulation throughout the housing area. Separating the industrial area from the housing will reduce to a minimum the hazard to children living in the housing area.

PART III - TRANSPORTATION FACILITIES

Public Transportation Facilities

Excellent public transportation is provided to the South End area from any section of the City of Boston by the Massachusetts Bay Transportation Authority. The elevated rapid transit through Washington Street has stations in the South End at Northampton Street and also at Dover Street. The Huntington Avenue Subway Rapid Transit which traverses the South End on the west has subway stations adjacent to the South End at Massachusetts Avenue (Prudential Station). Cross town bus service is provided which connects with these stations. There is additional bus service through Tremont Street which runs through the South End in a north-south direction. The majority of personnel who live in other sections of the city and are employed in these proposed industrial establishments can be presumed to use the public transportation system going to and from daily work.

Influence of New Housing and Restoration of Existing Buildings

The proximity of new housing units to be constructed under the current program of the Boston Redevelopment Authority together with their emphasis on restoration and repair of existing residential buildings in the South End will influence and encourage the developer of industrial installations in the area. Leases will be more easily secured because potential lessees will recognize that prospective employees will have the opportunity to live near their work. Families living in the neighborhood will benefit from this opportunity through reduced transportation costs and increased time for other activities - time and money that would be otherwise spent travelling to and from work.

Off Street Parking

Off street parking spaces will be provided at the industrial sites for those who drive their automobiles to work and for visitors having business with the tenants. Because of the public mass transportation system available, the ratio of required parking spaces to building population will be much less critical for the urban than for the suburban industrial installation.

Urban Land Institute Recommendations

The Urban Land Institute in Washington,D. C. published a Technical Bulletin in October 1952 which described ten planned industrial districts throughout the United States where sites are either leased or sold and the factory or warehouse building erected by either the site purchaser or the district developer. Most developers of these districts encourage construction of one story buildings and although there are generally no restrictions on height, the one story has evolved from economics of operation. The usual requirement is that the purchaser acquire a minimum of 50 percent more land area than needed for building alone. In an industrial district in Atlanta, Georgia, the ratio is 3 to 1. The trend is toward providing larger tracts for automobile parking spaces. These parking space requirements vary throughout the various districts, i.e., spaces equivalent to 30 percent of the number of employees on duty at one time; one space for each 5 employees; one space for each 1,000 square feet of gross floor area.

Parking Ratio to Prototype Building

For an example, we will apply the above ratios to a hypothetical prototype four story building containing 25,000 square feet per floor (4 tenant spaces at 6,250 square feet each), a total building area of 100,000 square

feet and 16 tenant spaces.

Subtracting areas required for freight elevators, passenger elevators, exit stairhalls, toilets and corridors, we estimate that each tenant area will have a net usable area of about 4,500 square feet. The density of occupation of tenanted areas will vary but if we allow an average of 100 square feet per person, we have a population of 45 persons per tenant area, a total building population of 720 persons.

Applying the Urban Land Institute parking ratios, the results indicate considerable spread in these planned suburban industrial districts:-

1. Allowing one space for 30 percent of the population = 216 spaces required per building.

2. Allowing one space for each 5 persons = 144 spaces required per building.

3. Allowing one space for each 1,000 square feet gross building area = 100 spaces required per building.

We believe that available mass transportation facilities will reduce the required number of parking spaces for a South End industrial installation by at least 50 percent. If we allow one space for each 2,000 square feet of gross building area, each building will require 50 spaces. This is in the ratio of one space per 14 persons on the basis of a building population of 720 persons. In our judgement, the latter is the preferable criteria.

PART IV - TYPICAL OCCUPANTS OF PROTOTYPE INDUSTRIAL BUILDING AND THEIR REQUIREMENTS

Type of Prospective Occupants

The following list of prospective occupants has been arranged in groups in an attempt to classify certain types of tenants which would have similar utility requirements. It will be noted that many of the occupants are not necessarily manufacturers and that certain tenanted areas will be occupied as distribution centers, particularly by those tenants whose goods are in the majority, distributed in the metropolitan area and therefore would operate more economically from a location within easy distance of the downtown section. A partial list of prospective tenants for these installations is as follows:-

Needle Trade Manufacturers - Apparel, Drapery

Furniture Upholstery and Repair

Custom Footwear - Novelty Slippers

Leather Goods - Gloves, Billfolds, Novelties, Handbags, Findings

Office Machine Repair - Typewriters and other Business Machines - rental - Drafting Room Equipment

Janitor's Supplies - Industrial Cleaning and Maintenance

Labeling Equipment - Labels

Linen Supply Service

Printing Jobbers - Stationery Supplies - Graphic Arts

Mailing - Advertising Services

Rubber Stamps - Marking Devices - Nameplates

Reproduction Services - Blueprinting - Photostat - Microfilm - Enlargement - Mimeographing

Vacuum Cleaning Equipment - Supplies - Parts - Repair

Distributors - Smallwares - Notions - Novelties

Displays - Decorations - Novelties - Manikins - Advertising - Exhibits

Jewelry - Optical - Supplies, Repairs, Findings

Musical Instrument Distributors - Repair - Service

Picture Framing - Mirrors and Framing - Custom Work

Electronics - Small Parts Manufacturing and Assembly

Electric Appliance Distributors - Electrical Supplies

Sound Equipment - Television - Communications Systems - Radio

Appliance Dealers - Washing Machines - Water Coolers, etc.

Sales Distribution - Service - Repair

Lighting Fixtures - Repair - Maintenance - Lamps - Shades

Plastic Products

Floor Covering Distributors - Floor Machine Rental - Repair - Service

Hospital Equipment Supply - Distributors - Laboratory Equipment - Suppliers

Housewares - Distributors

Aluminum Storm Windows - Screens - Jalousies - Venetian Blinds - Window Shades

Pharmaceutical Supplies

Instrument Service - Repair - Distribution

Tenant Area Requirements

It is believed that individual lease areas of approximately 6,000 square feet with the opportunity for a tenant to lease double, triple, or quadruple areas on the same floor will offer good flexibility for the developer in securing leases.

A building with 25,000 square feet of floor area will provide 4 tenant spaces of 6,250 square feet each. On the basis of the area, a 28 by 28 feet bay spacing conforms.

Eight bays, per tenant space, each space two bays wide by 4 bays deep, will provide 6,272 square feet (56 by 112 feet) per tenant. Four tenant spaces per floor will result in a building 4 bays deep by 8 bays long (112 by 224 feet long) 25,088 square feet per floor. If the 224 feet length is exceeded, an expansion joint through the building would be required. The depth could be increased up to 8 bays, each bay added would increase each tenant space area 1,568 square feet.

Tenant Subdivision Requirements

Subdivision requirements of different tenants will vary for factory and office areas and will not be known until the tenants are secured. Factory subdivisions such as shipping and receiving, stock room, tool cribs, etc., can be installed to meet the tenant's needs. The separating partitions can be removable, interchangeable, stock units made of wire mesh in metal frames. Office subdivisions will also be installed to meet the tenant's requirements.

PART V - FINANCIAL, STRUCTURAL AND MECHANICAL CONSIDERATIONS

Suburban Lease Space

Existing space is available in suburban one story buildings for 1.00 per square foot per year, net, the tenant also paying for maintenance and taxes; space may be leased for $2.50 per square foot including heat, power and light. The properties have adequate loading platform and automobile parking space.

In-town Lease Space

Space is available in existing loft buildings in the in-town Boston area for $1.00 to $1.50 per square foot for first floor and $.75 to $1.00 per square foot for upper floors (includes heat and light). The majority of in-town properties have small bay spacing, inadequate shipping facilities (freight elevators, loading platform and truck dock) and little or no automobile parking space.

Competitive Rental of Prototype Building

The prototype must be produced at a cost which will permit rental which is competitive with the above and yet offer adequate facilities that existing in-town properties lack. In our judgement, this rental should be in the vicinity of $2.50 per square foot. Consultation with realtors and financiers confirm this.

Elevator Considerations

Extent of freight and passenger elevators to be provided must be determined. The number of passenger elevators required is determined by a traffic study of the building population above the ground floor.

On the basis of a 4 story building with 25,000 square feet per floor (4 tenant spaces @ 6,250 square feet) each tenant space averaging 45 persons, 180 persons per floor, the building population above ground is 180 x 3 = 540 persons. The desirable passenger carrying capacity is 13 percent of the population in 5 minutes, or 70 persons. A car with a capacity of 12 persons will carry 10 persons per normal trip. For 36 feet of travel (3 floors at 12 feet) and a speed of 200 feet per minute, the round trip time will be about 80 seconds. In five minutes, two cars will carry 75 persons and the waiting interval will be 40 seconds. This is acceptable, therefore, two passenger elevators, car capacity 12 persons, speed 200 feet per minute will be required. Each elevator will cost approximately $30,000.00 exclusive of the cost of the shafts.

If the number of stories were increased to 6, the car capacity would be increased to 16 and the speed increased to 300 feet per minute. Elevators for such requirements would be approximately $36,000.00.

No well defined formula exists for the selection of freight elevators for the buildings. The uses to which they may be subjected can vary over a wide range. For efficient service, each bank of tenant areas in a building up to 6 stories high should be equipped with a freight elevator. Four tenant areas per floor will require 4 elevators. Size and capacity of the cars is determined by evaluating freight traffic in terms of the number, size and weight of the pieces to be carried. Consideration must be given to the use of power trucks carrying palletized materials. These trucks weigh from 3,000 to 5,000 pounds. Pallets vary in width from 48 inches to 56 inches. For two pallet width loads the car width should be 10 feet. Car size should be 10 by 10 feet with minimum capacity of 8,000 pounds and minimum speed of

75 feet per minute. It should be designed for Class C loading so a one piece load of full car capacity can be accommodated. Each freight elevator will cost approximately $30,000. for a four story building; $35,000. for a six story building, each price exclusive of cost of the shaft.

Freight and passenger elevator service for a four story building having a total floor area of 100,000 square feet (25,000 square feet and four tenant spaces per floor) will represent an initial cost of approximately $180,000.00 - more than $7.00 per square foot for the building area and about $1.80 per square foot of floor area.

The same service for a six story building having a total floor area of 150,000 square feet (25,000 square feet and four tenant spaces per floor) will represent an initial cost of approximately $214,000.00 - about $8.60 per square foot for the building area and about $1.40 per square foot of floor area. This indicates a savings of approximately $.40 per square foot for a 6 story building.

A building 8 stories high will require an additional passenger elevator and an increase in the freight facility, so the economy of adding stories to distribute elevator costs ceases at six stories.

Structural Foundation Considerations

Foundation costs for any site in the South End which is not on the original Washington Street peninsula will add about $1.00 per square foot of floor area to the cost of the building.

The Boston Society of Civil Engineers publish a book entitled "Boring Data from Greater Boston." A set of maps accompanies the book, showing locations of the borings.

A good number of them are in the South End area and indicate that subsoil conditions should be thoroughly investigated at any specific site in the area prior to the design of foundations for any structure. Areas adjacent to the Washington Street strip and the Roxbury district will probably call for caissons. Other sites in the South End will most likely require piles.

Borings to be taken for any proposed building will be located within the building area. Until the building location is crystalized, we do not believe that additional boring information is required.

A four story building having a bay spacing of 28 feet by 28 feet will develop a column foundation load in the vicinity of 450 tons. The boring reports will determine the most economical foundation system to be employed.

Consultation with responsible financial houses, realtors and potential developers indicate that these buildings will not be constructed on speculation. They will be financed on the basis of secured tenant leases.

Analysis of Bay Spacing

Analysis of various bay spacing for different structural floor systems in terms of merit and cost has been done to properly determine the most suitable and economical framing scheme for the prototype building.

Systems considered worth investigation are:-

(a) Concrete flat slab

(b) Concrete beams and slabs

(c) Concrete joists and beams

(d) Concrete grid system

(e) Concrete slabs, fireproofed steel beams

(f) Precast, prestressed floor systems

Flat Slab Framing

Concrete flat slab buildings are ideally suited for industrial occupancy. Inadvertent overloadings are distributed and absorbed in a structure of this nature.

The Boston Code specifies minimum slab thickness requirements for flat slab systems to be not less than 1/40 the length of the panel or less than 6 inches. Structural analysis conforming to this criteria will demonstrate that a floor system designed to sustain a live load of 150 pounds per square foot will cost very little more than one designed for 75 pounds per square foot. Adding the additional steel to the required slab thickness will provide a structure which will accommodate the 150 pound live loading. This would place the structure in the intermediate manufacturing category and therefore increase its flexibility for admission of a greater number of prospective tenants. Foundation requirements would be increased but to a minor degree in the light of advantage gained for the additional cost.

Uniform Bay Spacing

Uniform bay spacing will allow employment of most economical construction techniques and speed erection. Repetitive use of forms and placement of reinforcing steel will reduce material and labor costs in reinforced concrete construction. The irregular shaped and odd bay sizes will increase construction costs. The square bay will prove most economical for flat slab systems.

Structural Drawing Data

Drawing S-1 shows framing and cost analyses for a typical bay for six different structural systems considered worth investigation.

For comparison, we have included the two systems considered most suitable for the prototype in our preliminary engineering cost estimate as indicated in Part VIII. They are designed on Drawing S-1 as Scheme #1, Concrete Flat Slab with Drop Panels and Scheme #4, Two Way Grid Flat Slab. Total cost estimates for reinforcement, concrete and formwork are given in the column at the right-hand side of the drawing. Scheme #4 is $1.81 per square foot; scheme #1 is $2.03 per square foot. The volume of concrete for the column and its capital is the same for both systems. The volume of concrete in the grid flat slab for a typical bay is 20 cubic yards and for the flat slab with drop panels is 23 cubic yards. The saving in concrete for the grid flat slab will also be reflected as a saving in foundation cost, due to the reduction of dead load; this is indicated on Drawing A-11 which shows the estimated number of piles required at each column location for the above two systems and for a four and six story building. Due to the magnitude of the column loads and the nature of the soil in the area, we have based our foundation analyses on the use of concrete filled steel shell piles driven to refusal, with a load capacity of 105 tons per pile. We believe the average length of the piles will be 80 feet at an estimated cost of $10.00 per lineal foot or $800.00 per pile.

Cost Estimate Structural Data

(a) Pages 51 to 60 inclusive of the preliminary cost estimate section contain cost breakdowns of various parts of the work.

(b) Pages 61 through 64 inclusive are cost summaries of four and six story buildings for both flat slab with drop panels and grid flat slab construction.

(c) Page 65 is a tabulated cost analysis of the four buildings. It gives a total cost for each building and the proportion of total cost attributable to the various parts of the work.

(d) The difference in cost between the flat slab and the grid flat slab systems for a four or six story building, respectively is relatively small in the overall picture, but it is sufficient to recommend the use of the grid flat slab. The six story height is the most economical to build in terms of dollars per square foot building cost.

(e) The cost analysis shows that buildings of this size and construction may be built for about $13.00 per square foot. Additional stories beyond six stories will reflect an increase in cost per square foot because vertical transportation facilities would have to be increased to properly serve the added building population and area. Additional horizontal increments in length of the building will produce the same result, magnified by the cost of incorporating an expansion joint through the building.

Exterior Wall System Considerations

Exterior wall systems considered to merit analysis are:-

(a) Masonry units

(b) Precast concrete panels which could be cast at the job or plant fabricated if proven economical. Panels can be given a variety of face treatments for architectural appearance.

(c) Prefabricated, insulated panels in metal frames for office facades.

General Utility Requirements

Utility requirements of prospective tenants can vary to a substantial degree. Firm requirements for a specific tenant will not be known until the

lessee is secured. Requirements of any tenant area can change with the change of lessees.

Provisions for Variable Tenant Utility Requirements

Modification of processes can change utility requirements in any tenant area. Certain tenants require ventilation, air conditioning or humidification for their processes while adjacent tenants may have no use for them. Certain tenants will want air conditioning in their offices, others may not. Electric power requirements for different tenants will also vary a great deal.

The prototype will be designed in a practical sense to provide for these variables. Standard utilities such as electric, gas, hot and cold water, sewer, drainage and telephone will be provided in all tenant areas. Valves, plugged tees and "Y" branches will also be installed so additional connections can be made when required. A utility shaft through the building will be located in the manufacturing area with access panels to the shaft from each tenanted area. Special utilities may be installed in these shafts to meet special requirements with little or no alteration to the building.

A similar but smaller shaft through the building will be located in the office area to accommodate tenants which want air conditioning.

A central transformer room should be provided in each building with electric closets in each floor containing a disconnect switch and separate meter for each tenant on the floor. Each building should be designed to include its own boiler room but if several buildings were constructed simultaneously by the same developer, a single boiler room properly located could serve the project.

If Edison steam is available at the site and its use proven economical, a central mechanical service room would be provided.

Condensate meters can be installed on each tenant's return line if it is desired to meter steam consumption.

In order to retain maximum ground floor area for rental, a partial basement for each building will be considered; large enough to contain the boiler or mechanical service room, transformer and electric service rooms, building maintenance, storage room and exit stairways. One freight elevator would be carried down to this level.

Code Problems

Some savings in construction costs could be affected if the higher allowable unit stresses for concrete and high strength steel permitted by the American Concrete Institute and American Institute of Steel Construction could be used for design instead of those permitted by the building code of the City of Boston.

If locations of sites finally selected for industrial development are not in conformance with the Boston zoning regulations, an appeal for variance must be filed with the Zoning Board prior to an application for a building permit.

PART VI - GENERAL DESCRIPTION OF BUILDINGS AND FACILITIES

Basic Functions of Prototype Building

Four basic functions comprise the fundamental spaces required for the operation of the majority of industrial enterprises. They are administration, manufacturing, receiving and shipping. Since industrial processes are many and varied, the design of a prototype industrial installation will be tailored to afford maximum flexibility for the greatest number of prospective tenants. The building will be designed with maximum bay spacing consistent with practical economical engineering practice to eliminate columns as much as possible.

Standard and Special Utility Provisions

The usual standard utilities will be provided and provision made to accommodate the installation of special or additional utilities that may be required by certain tenants, all as previously described in Part V, Financial, Structural and Mechanical Considerations.

Practical Story Height

A practical story height for the prototype will be based on sufficient height in the manufacturing area to allow for overhead distribution of utilities such as air handling duct systems, clearance for lighting fixtures, unit heaters and drainage systems from the floor above. If we allow 2 feet 6 inches for these utilities and 1 foot for floor construction and 8 feet 6 inches clear height, we arrive at a 12 feet story height. Ceilings are not normally required in the manufacturing, shipping and receiving areas. Slab soffits can be left exposed and painted.

Overhead utilities, installed in an orderly fashion, are not objectionable in appearance and are readily accessible for maintenance or change.

Bay Spacing

The accompanying drawings A-1, A-2 and A-3 show the floor plans of a prototype building, indicating four tenant spaces per floor, each tenant space approximately 6,250 square feet in area. A four story building will provide 16 tenant spaces; 6 stories - 24 spaces. The building is designed with uniform, square, 28 by 28 feet bays, 8 bays per tenant area. The 28 foot spacing is structurally economical, and provides the minimum number of columns in each tenant area.

The 8 bay length of the building results in maximum building length per structure without requiring an expansion joint. The depth of the building could be increased up to 8 bays, offering 4 tenant areas up to 12,500 square feet per floor. We have delineated the prototype with the 4 bay depth because we believe that tenant areas in the vicinity of 6,000 feet will more readily be leased. A single tenant may lease one or more adjacent tenant areas.

Elevators

Each bank of tenant areas is equipped with a freight elevator with a 10 by 10 foot car platform with 8,000 pounds capacity, class C loading, and speed of 75 feet per minute.

Each building will be equipped with 2 passenger elevators, each of 2,000 pounds, 12 passenger capacity and a speed of 200 feet per minute.

Toilet Facilities

Separate toilet facilities will be provided for manufacturing and office personnel for each tenant area.

Separating of Offices and Manufacturing Area

To serve as a sound lock and to afford maximum quiet in the office areas, a circulating corridor throughout the length of the building will separate the manufacturing areas from the office areas. The corridor and offices occupy one bay of the building depth. The floor slab in this bay is designed to sustain a live load of 150 pounds per square foot.

Loading Platform

A continuous loading platform extends the entire length of the rear of the building at the ground floor level providing maximum facility for loading and unloading trucks at each bank of tenant areas. All freight elevators have direct access to the loading platform.

Partitions and Ceilings

Partitions enclosing corridors, staircases, elevators, toilets and the separating partitions between tenant areas are permanent partitions of concrete block. Partitions in the office areas are movable stock modular, interchangeable units, installed to meet tenant's requirements. They may be removed and re-erected at any time by building maintenance personnel to suit changing requirements. The 4 feet module is employed for office partitions and suspended acoustical ceiling system in the office areas. The floor covering and the ceiling will be installed prior to installation of the movable office partitions.

Lighting System

The lighting system used in the office area will be integrated with the ceiling suspension system. It will consist of two continuous raceways into which interchangeable fluorescent fixture units may be plugged. The fixture soffits will finish flush with the ceiling. This system will offer the utmost lighting flexibility to meet requirements of any tenant. Lighting intensity may vary from 40 to 240 foot candles in any portion of the office area. Fixtures and fill-in sections may be removed, replaced, or rearranged at any time without rewiring or interrupting the ceiling such as is ordinarily required for addition or removal of partitions. Lighting intensity may be increased or subdued as desired by any tenant for reception, office or display; these areas can vary in size or be changed in configuration to meet the tenant's requirements.

Acoustical Ceiling Panels

The acoustical ceiling panels in the office area will be the removable, drop-in type, supported on a tee suspension system, allowing full access to the space above the ceiling for installation or alteration of utilities that may be required. A similar ceiling system will be installed in the main corridor except that lighting fixtures will be the usual permanent type.

Office Arrangement Schemes

Drawings A-7 and A-8 illustrate a few of the many office arrangements obtainable, using movable partitions and the lighting system described above. Interchangeable closets and cabinets match the movable partitions.

Accommodations for Tenant's Utility Requirements

Story height for the building will be 12 feet. Lighting fixture soffits will be 8 feet 4 inches above floor, allowing approximately 2 feet 6 inches above the fixtures to the slab soffit above for distribution of utilities that may be required by any tenant. Each tenant area has access to a utility shaft in the factory area. The shaft will contain standard utilities such as gas, hot and cold water and drainage with valves and "Y" branches so any tenant can avail himself of those he may require. Access panels will also be provided in the shaft to accommodate special utility requirements such as air exhaust or conditioning systems. Utility shafts will extend through the roof and terminate in a penthouse in which fans or other equipment may be installed.

A portion of each building will contain a basement as shown on Drawing A-1. One freight elevator will be carried down to this level.

A space is provided adjacent to the utility shaft in all tenant office areas for an air conditioning unit which may be installed at the tenant's option.

Manufacturing Area Arrangement Schemes

Drawing A-6 illustrates a few of the many alternate arrangements for work flow in the factory areas. The lighting system in the factory area will consist of 3 continuous raceways per bay, suspended from the structural slab which will be left exposed and painted. Interchangeable fluorescent fixtures units may be plugged into these raceways, spaced as desired by the tenant to provide the lighting intensity he requires in any location and to accommodate changing lighting needs.

Additional office or display may occupy a portion of the area as shown, if the tenant so desires. Partitions subdividing factory areas such as receiving, stock room, tool crib, etc., are removable, interchangeable units of wire mesh in metal channel frames, installed to meet the tenant's requirements. The clear height for the basement will be 10 feet except for the boiler room which will be 16 feet. There will be a crawl space under the remainder of the building, accessible from the basement.

Exterior Architectural Treatment

Drawings A-4, A-5 illustrate architectural treatment of the exterior of the building. A simple, prefabricated, insulated panel system is employed for the office facade. The 4 foot modular width is again used and co-ordinated with the interior modular design of the office partition and ceiling system. Exterior faces of panels will be porcelain enamel, interior face galvanized steel, painted. Panel core insulation to provide a "U" factor of not more than .20. The windows will be steel, projected, stock sash with vents arranged so cleaning may be accomplished from the inside. Windows and panels will be set in stock, prefabricated steel frames. Windows and frames will be galvanized, bonderized and field painted.

The colored perspective at the front of this report illustrates a variation of the above system, designed to provide opportunity for the erection of signs by tenants, yet preserve a dignified uniformity of architectural treatment. For this scheme, a sign outlet would be provided in the spandrels above certain windows as indicated. Removable signs to fit the spandrel would be installed and could be changed upon change of tenants. A minimum amount of stone trim will be used on this facade.

Remainder of this wall, also the rear and end walls of the building will be face brick bonded to 8 inch concrete block backup, total wall thickness will be 12 inches. Interior face of the concrete block will be left exposed and painted. Windows in the rear and end walls of the building will also be stock, steel projected sash with vents arranged for window cleaning from inside the building.

Interior walls of the main entrance lobby and vestibules will have a minimum of architectural treatment such as a combination of textured and faced concrete block.

Further description of the features of the prototype building are included in PART VII - Outline Specifications.

PART VII - OUTLINE SPECIFICATIONS

SECTION I

ARCHITECTURAL

I-1. SCOPE OF THE PROJECT

The project consists of a multi-story manufacturing plant to be erected in the South End Urban Renewal Area located within the City of Boston.

The building will be 4 or 6 stories in height, and will have a partial basement. There will be a crawl space under the remainder of the building area with access from the basement. The basement will contain a Boiler Room, Transformer Vault, Electric Service Room, Building Maintenance, Storage, and Custodian's Room.

Each typical floor will have 4 tenant spaces consisting of Office and Manufacturing areas, toilet facilities, and staircases.

Freight elevator service is provided for each bank of tenant areas.

The building is served by two passenger elevators. Elevator machines are located in Penthouses on the roof.

The building is 8 bays long and 4 bays wide, all bays 28' x 28'. A continuous loading platform with canopy extends the full length of the rear of the building, at the ground floor level.

I-2. PREPARATION OF SITE

This includes removal of all existing obstructions, all excavation and backfill, fill placement and compaction, installation of bituminous concrete roads and parking areas, concrete walks, loaming and seeding and all related items to fully complete the work within the project limits.

I-3. FOUNDATIONS

The building is to be entirely supported on concrete filled steel shell piles, driven to refusal. Each pile to have a load capacity of 105 tons. Pile caps, grade beams, basement walls and floors are to be reinforced concrete.

I-4. FRAMING

The superstructure will be of reinforced concrete columns, grid flat slab floor and roof slabs with no drop panels, reinforced concrete beams at stair, elevator and shaft openings three floors, and reinforced concrete spandrels.

I-5. MASONRY

Except for the insulated panels at the office facade, exterior walls of the superstructure are face brick, bonded to concrete masonry backup units. Where backup is the reinforced concrete frame, dovetail slots and galvanized steel anchors will be used.

Limestone will be used for window sills throughout and for trim on the office facade.

Permanent interior partitions will be concrete masonry units. Entrance stairs in main lobby are reinforced concrete with precast terrazzo treads and risers.

Concrete floors in manufacturing areas, basement and loading platform will be left exposed and receive a floor hardener treatment.

I-6. ROOFING AND FLASHING

In general, roofing will be 20 year, bonded built up roofing, applied over rigid insulation and vapor barrier. Base flashings will be built up

cap flashings will be copper. Roofs will have standard roof drains and interior conductors. Through wall flashing at exterior wall openings to be 5 ounce protected copper.

I-7. METAL WINDOWS

All windows will be intermediate grade, projected, steel, prepared to receive screens, ventilators as shown. Windows to be galvanized and bonderized, delivered with one shop coat of paint and be complete with hardware.

I-8. METAL CURTAINWALL

Curtainwalls to be 12 gauge, formed horizontal and vertical frames, welded construction, factory assembled. Panels approximately 1-3/4" thick 18 gauge, galvanized, bonderized steel pan type with fiberglas insulation, and faced on the outside with 16 gauge porcelain enameled sheet with gasket sealed edges, "U" factor not more than .20. Grid units and back panel to be delivered with one shop coat of paint.

I-9. DAMPPROOFING, WATERPROOFING AND CAULKING

Unless otherwise noted, all basement walls will be dampproofed with two coats of brush applied bituminous material on the exterior face up to finished grades.

All exterior openings in masonry walls to be perimeter caulked with plastic caulking compound.

Waterproofing to be installed where required to be metallic cement plaster type.

I-10. GLASS AND GLAZING

Glass for metal sash to be double strength "B" quality, set in glazing compound.

Aluminum entrances will be narrow style with 1/4" plate glass.

I-11. MISCELLANEOUS IRON

This includes steel stairs, railings, elevator beams, metal thresholds, and guard angles.

Typical interior stairs will be pan type with granolithic treads and landings and standard steel pipe rails. Stairs in main entrance lobby will have aluminum rails.

I-12. METAL DOORS AND FRAMES

Interior doors in permanent partitions will be 16 gauge, 1-3/4 inch thick hollow metal with 16 gauge pressed metal combination frame, jamb and trim.

I-13. METAL LATH AND PLASTER

Ceilings in toilet areas will be suspended metal channel, metal lath and three coat plaster, finish coat Keene's cement.

I-14. ACOUSTICAL TILE

Ceilings in the office areas and main corridor will be removable 2' x 4' acoustical panels, 1" thick. Exposed face of panels to be perforated .01" thick steel, back panel to be solid of same thickness, edges to be mechanically locked. Sound absorbing element to be non-dusting fibrous glass. Finish to be baked white enamel. Panels to be supported on an exposed T grid system with same enamel finish, and shall provide complete access to the space above the ceiling.

Acoustical ceilings are to be co-ordinated with lighting systems.

I-15. HARDWARE

All hardware shall be supplied and installed to adequately equip all operating units.

Keying system will be a Grand Master Key System.

I-16. TILE

Toilet rooms and service closets will have ceramic, non-slip tile floors and glazed ceramic tile dado. Dados will be applied by the thin set mortar method.

I-17. TERRAZZO

Main entrance vestibule and lobby will have terrazzo floor and base. Main entrance stairs will have precast terrazzo treads and risers.

I-18. RESILIENT FLOORING

Corridors and office areas will have 1/8" thick 9" x 9" asphalt tile floor covering. Masonry partitions adjacent to asphalt tile floors will have 4" high, standard rubber, set-on type base.

I-19. TOILET COMPARTMENT PARTITIONS

Toilet compartment partitions will be floor supported, flush type enameled steel partitions and doors.

I-20. MOVABLE OFFICE PARTITIONS

To be stock, flush type steel, sound deadened, movable units, height as noted, factory finished, in baked enamel, designed to quickly accommodate any change in layout after original installation.

All partitions and parts to be 100% reusable. All units to be shipped from the factory in one piece, all panel and door units interchangeable. Doors to be 1-3/4" thick, complete with hardware. Bases shall be removable both sides for ready access to wiring raceway.

I-21. MOVABLE WIRE MESH PARTITIONS, MANUFACTURING AREAS

To be stock, interchangeable, prefabricated, movable standard units which can be arranged in any desired combination, heights as noted, fabricated of 10 gauge steel wire woven into 1-1/2" diamond mesh securely clinched to cold rolled channel frames. Door and service window panels as shown, all factory finished in baked enamel, and complete with hardware. All partitions and parts to be 100% reusable.

I-22. OVERHEAD DOORS

Doors from manufacturing areas to freight elevator vestibules are roll-up interlocking steel slat, chain operated.

Overhead doors to loading platform are heavy duty, steel, sectional type with counterbalance torsion spring. They shall be glazed as indicated.

I-23. ELEVATORS

Each passenger elevator will be 2,000 pound, 12 person capacity with speed of 200 feet per minute, 6'4" wide x 4'5" deep platform size, automatic leveling, push button duplex selective operation, with horizontally sliding doors. Elevator machines located directly over the hoistway in a penthouse.

Each freight elevator will be 8,000 pound capacity, Class C industrial truck loading, speed of 75 feet per minute, 10'0" x 10'0" platform, automatic leveling, with manually operated bi-parting vertical sliding doors. Machines to be located directly over the shaftway in a penthouse.

I-24. PAINTING

This includes the painting of all interior concrete masonry partitions, exposed interior surfaces of exterior concrete masonry walls, interior exposed concrete surfaces except floors, interior plaster ceilings, exterior and interior ferrous metal, except factory finished movable partitions.

SECTION II

PLUMBING

II-1. SCOPE

(a) Sanitary Drainage System - Complete sanitary drainage system within the building, connecting to all fixtures, equipment, drains and vertical runs with tap-offs in shafts throughout the building for tenant use, extending and terminating the building main drains at a point ten feet outside the building.

(b) Storm Drainage System - Complete storm drainage system in building for interior roof drains and canopy drains, extending and terminating the building main drains at points 10 feet outside the building.

(c) Domestic Cold Water System - Complete domestic cold water system within the building, connecting to all fixtures, equipment, and vertical runs with valved tap-offs in shafts provided for tenant use. The system shall begin ten feet outside the building having a meter just inside and run horizontally in the basement area and crawl spaces rising where necessary.

(d) Domestic Hot Water System - Complete domestic hot water system within the building; connecting to all fixtures, equipment, vertical risers with valved tap-offs in shafts provided and including steam run 140°F. hot water storage heaters in boiler room area. System shall include recirculating main with circulating pump. Mains shall be run through basement and crawl space areas.

(d) Gas System - Complete gas piping system inside the building from the meter provided by the Boston Gas Company. The interior system shall include low pressure gas mains and risers, including risers with valved tap-offs

in utility shafts. All branches to gas firing equipment and appliances will be valved.

(f) Sprinkler System - A complete sprinkler system will be installed in the basement and boiler room areas only and shall be installed in accordance to the latest City of Boston Code and the National Fire Protection Association. Fire extinguishers will be installed throughout the building to NBFU standards.

II-2. INSTALLATION

Installation shall be in accordance with the latest applicable City of Boston and Commonwealth of Massachusetts Codes.

II-3. MATERIALS

(a) Underground water service and interior piping above 4" size - cast iron cement lined bell and spigot class 150 water pipe with Class "D" cement lined fittings; joints to be made with oakum and lead.

(b) Interior water piping 4" and under - all hot, cold, recirculating water inside the building shall be type "L" copper tubing with cast brass fittings suitable for soldered joints. Joints shall be made with 95-5% tin antimony solder.

(c) Gas Service - Standard weight iron size black steel pipe with screwed and/or welded joints.

(d) Soil, waste, vent and roof conductor piping. Extra heavy cast iron bell and spigot soil pipe and fittings. Joints made with oakum and lead. Vent piping 2" and smaller installed above ground may be galvanized standard weight steel pipe with cast iron fittings. Short waste branches to fixtures may be type "L" copper tubing or iron size brass or copper pipe with recessed drainage fittings.

(e) Sprinkler piping - Standard weight black iron steel pipe with malleable iron screwed fittings.

(f) Insulation - Pipe insulation shall be 1-1/2 inch molded fibrous glass low pressure insulation. Cold water and roof conductor lines shall have vapor barrier. Exposed piping shall have an additional 8 ounce canvas jacket. Hot water tanks shall be insulated with 1-1/2 inch thick 85% magnesia blocks with hard cement coat finish.

(g) Hot water storage heaters - Hot water storage tanks shall be constructed of steel with copper lining built for 127-1/2 pounds working pressure in accordance with ASME and Massachusetts standard requirements. Tank shall be heated by steam with copper heating coils located inside the tank.

(h) Hot water circulating pump shall be automatic electric motor driven all bronze body of capacity required.

(i) Valves - Valves on water lines to be bronze or brass throughout with packing glands, stuffing boxes and nuts, solid wedge, screw or union bonnets, designed for 150 pound steam working pressure and shall have screwed ends except for sizes above 3 inches.

(j) Cleanouts shall be Boston Regulation pattern brass cleanouts installed at all points necessary to make all portions of the drainage system accessible for cleaning purposes.

(k) Plumbing Fixtures - Complete with trim, of the latest models of Crane Co., Kohler Co., or Eljer Co., wall hung whenever possible. Drinking fountains to be wall hung electric water coolers.

(l) Fire Extinguishers - Chemical first aid extinguishers designed and built to NBFU requirements.

Soda and ash type generally and CO_2 type in mechanical equipment spaces.

(m) Toilet accessories - Mirrors, soap dispensers, shelves, paper dispensers, etc., as required.

(n) Floor and roof drains - Cast iron throughout, with brass strainers as required, Josam, Zurn, Smith, or equal. Fifteen (15) wall hydrants - non-freeze type - cast bronze.

SECTION III

HEATING AND VENTILATING

III-1. SCOPE

The scope of the work, without limiting the generality thereof, consists of furnishing and installing complete and ready for use the following systems in the building:-

(a) General - Each system incorporated in the building shall be designed to yield flexibility for diversified tenant requirements.

(b) Heating and ventilating systems in the manufacturing area are included in this section of the specifications and shall be done to suit tenant requirements.

(c) Boilers - Low pressure (15 psig) steam generators complete with all appurtenances and piping for a total capacity of 8,000 pounds per hour of steam in the boiler located in the basement of the building.

(d) Commercial steam - If steam is available from a commercial source, at the option of the owner, a pressure reducing station 100/15 psig with all required piping shall be provided in the mechanical equipment room instead of the steam generators.

(e) Steam distribution - Steam and condensate risers in the shafts of the manufacturing areas and office areas including horizontal mains from the boiler room to the shafts and complete with hangers, guides, anchors, and expansion loops or joints.

(f) Capped branch tees - At each floor, capped branch tees shall be provided on the supply and return risers in the shafts of the manufacturing areas for future connection of piping serving each tenanted manufacturing area.

(g) Metered steam - If steam for heating and/or process is to be metered for each tenant, a condensate meter shall be provided at each tenanted manufacturing area.

(h) Office area heating - Finned tube baseboard radiation with piping, traps, valves and all accessories for heating the office areas to 72˚F. when outside temperature is 0˚F.

(i) Ventilation - Ventilation supply and exhaust ductwork in each shaft. Ductwork shall be designed to provide 0.5 cfm per square foot of area.

(j) Toilet Ventilation - Complete exhaust ventilation systems with roof fans, ductwork and registers to provide 12 air changes per hour.

(k) Insulation - Pipe insulation as applicable for the service including valves, flanges, fittings and equipment.

III-2. MATERIALS

(a) Piping and Fittings - Steam piping shall be Schedule 40 black steel with malleable iron screwed fittings for piping 2 inches and smaller and welded fittings for piping 2-1/2 inches and larger. Condensate return piping shall be standard weight wrought iron with malleable iron screwed fittings for pipe 2 inches and smaller and wrought iron welded fittings for pipe 2-1/2 inches and larger.

(b) Valves - Gate and Globe - Low pressure steam valves 2 inches and smaller shall be 125 pound class, bronze, with non-rising stem, screwed ends for sizes up to 2 inches and 125 pounds, flanged ends, cast iron body, bronze trim, outside screw and yoke type for sizes 2-1/2 inches and larger.

(c) High pressure steam valves shall be same as for low pressure except they shall be 250 pound cast iron class.

(d) Check valves shall be horizontal swing type of materials specified in III-2 (a) and (b).

(e) Pressure Reducing Valves - Shall be pilot operated 125 or 250 pound cast iron body with stainless steel trim as required for the service. Basket type strainers shall be provided in the inlet connection to each valve. Relief valves shall be provided in the down stream connection with discharge pipe to atmosphere.

(f) Traps -

(1) Inverted bucket type for dripping high pressure steam lines and equipment.

(2) Float and thermostatic type for low pressure steam lines and equipment.

(3) Thermostatic traps in return connection of finned tube radiation.

(4) "Y" type strainers at inlet of each steam trap.

(g) Pressure gauges shall be Bourdon tube type and shall be provided at inlet and outlet of pressure reducing valves.

(h) Ductwork shall be galvanized steel of gauges in accordance with the latest edition of the "ASHRAE" Guide.

(i) Registers and grilles shall be of standard manufacturer of the sizes and capacities required.

(j) Fans shall be centrifugal roof type exhausters of size and capacity required, tested and rated in accordance with the AMCA and ASHRAE Codes. Fans shall be equipped with vibration eliminator bases and disconnect switch.

(k) Flexible Connections - Asbestos cloth collars shall be provided at the duct connection of each fan.

(l) Fire Dampers - Metal clad asbestos fire dampers with fusible link shall be provided as required by the Commonwealth of Massachusetts.

(m) Radiation - Radiation in the office areas shall be finned tube baseboard type complete with shutoff valves and traps.

III-3. TESTING

All piping shall be satisfactorily hydrostatically tested prior to installation of insulation. Performance tests shall be conducted for the boiler room equipment, offices,heating systems and toilets exhaust ventilation systems prior to final acceptance.

III-4. MANUFACTURING AREAS VENTILATION SYSTEMS shall consist of air handlers with ductwork distribution systems to air diffusers within each manufacturing area. Air handlers shall take air from the supply duct main in the building shaft and heating coils in the units shall temper the air as required in cold weather.

SECTION IV

ELECTRIC WORK

IV-1. GENERAL

(a) All electrical work shall be in accordance with the latest rules and regulations of the National Electrical Code, the Electrical Inspection Department of the City of Boston, the Boston Edison Company, and the Massachusetts Department of Public Safety.

(b) The building owner will provide electric facilities for all secondary service equipment and feeders for all basement lighting and power, for corridor, stairway and foyer lighting, for elevators, street lighting, emergency lighting, and for basic tenant lighting and convenience outlets.

(c) The respective tenants will provide electric facilities for lighting over and above the basic lighting facilities provided by the building owner and for their individual power requirements including air conditioning.

(d) The building owner will provide electric energy for all basement lighting and power, corridor stairway and foyer lighting, elevators and street lighting. This energy will be metered by a single meter in the basement electric room.

(e) The respective tenant will provide electric energy for all lighting and power consumed within the respective tenant area. This energy will be metered by meters in the electric room adjacent to the tenant area.

IV-2. SERVICE

(a) Electric service for the project will be from underground lines

of the Boston Edison Company, at either 4,160 or 13,800 volts, 3 phase, depending on the building load, with transformation in each building to 120/208 volt, 3 phase, 4 wire.

(b) The Boston Edison Company will furnish and install the underground electric service to the building, charging the building owner for that portion of the installation from a point two feet inside the property line to the building. The Boston Edison Company will furnish and install required transformation and primary disconnects in a transformer vault provided by the building owner within the basement of the building.

(c) The Boston Edison Company will meter the electrical energy required by the building owner at a location in the electric room provided in the basement of the building. The Boston Edison Company will meter the electrical energy required by the respective tenants at the respective electric rooms adjacent to the tenant areas.

IV-3. SERVICE EQUIPMENT

(a) In the electric room, in the building basement, adjacent to the transformer vault, there will be a main building service disconnect switch, a building owner's service disconnect switch, facilities for building owner metering, a building owner's panelboard and service disconnect switches controlling the tenant feeders to the electric rooms on the various tenant floors.

(b) In the electric rooms on the various tenant floors, there will be tenant service disconnect switches, facilities for tenant metering and as required building owner panelboards.

(c) Service disconnect switches in the basement electric room will be of the standard type, of adequate size and interrupting capacity for the loads to be served.

(d) Tenant service disconnect switches will be suitable for attachment to bus duct and will be of adequate size and interrupting capacity for the loads to be served.

(e) Metering facilities will be as required by the loads being served.

IV-4. FEEDERS

(a) Feeders supplying building owner panelboards on the tenant floors, used for corridor, stairway and foyer lighting, and feeders to the elevator machine rooms will be of conduit and cable of adequate sizes for the loads being served. These feeders will originate at the building owner's panelboard in the basement electric room.

(b) Tenant feeders to the electric rooms on the various tenant floors will be of plug-in bus-duct type of adequate capacity for the loads being served. These feeders will originate at service disconnect switches in the basement electric room.

(c) In each building, there will be one building owner's panelboard feeder, one feeder for each grouping of elevators and two tenant feeders, one for each tier of electric rooms.

IV-5. PANELBOARDS

(a) All panelboards will be of the bolt-in circuit breaker type with the number of branches of sizes and number of poles as required by the loads being served. All panelboards will have lugs only in the mains and will

have 3 pole and solid neutral mains.

(b) Building owner panelboards will be located in the various electric closets as required.

(c) Tenant panelboards will be located in the tenant manufacturing areas.

IV-6. RECEPTACLES

(a) Convenience receptacles will be located throughout the tenants office and manufacturing areas. Convenience receptacles shall be rated 15 ampere, 125 volt, single phase, grounded type, of specification grade.

(b) Power receptacles in tenant manufacturing areas will be the responsibility of the tenant.

IV-7. WALL SWITCHES

(a) Wall switches for control of room lighting will be 20 ampere, totally enclosed, specification grade, single, double, or 3-way as required. Switches shall be A. C. rated.

IV-8. MOTORS

(a) All motors shall be of adequate rating for the size and type of loads being served.

(b) Motors rated 1/2 horsepower and lower shall be suitable for operation on 120 volt, single phase.

(c) Motors rated 3/4 horsepower and larger shall be suitable for operation of 208 volts, three phase.

IV-9. FIXTURES

(a) Electric fixtures in the office and manufacturing areas will be of the fluorescent type and shall employ the Gibson "Uni-Race" method of

installation or an approved equal system. This system employs a basic "Uni-Race" assembly into which the fluorescent fixture units are installed with the electrical connection between the "Uni-Race" assembly and the fixture being made through a plug-in arrangement. Illumination levels may be increased or decreased by adding or removing fixture units without disturbing the basic "Uni-Race" assembly.

(b) Electric fixtures in the office area will be of the recessed commercial type with option of louver or lens diffusers.

(c) Electric fixtures in the manufacturing area will be of the pendant industrial type.

(d) Only sufficient fixtures to produce an illumination level of twenty foot candles will be installed under this basic contract. Additional fixtures required for higher levels of illumination will be the responsibility of the tenant.

(e) In the office area, there will be two rows of recessed fixtures. In the manufacturing area, there will be three rows of fixtures per bay.

(f) Electric fixtures for the corridors and foyer will be of the recessed fluorescent type, individual units, spaced to give an illumination level of 10 foot candles.

(g) Stairway and toilet room electrical fixtures shall be of the recessed incandescent type of wattage sufficient to produce an illumination level of 10 foot candles.

(h) Electric fixtures for the basement areas will be of the incandescent type with RIM dome reflectors of adequate wattage to produce an illumination level sufficient for the type area being served.

(i) Platform lighting will be of the incandescent type with dome reflectors.

IV-10. WIRING

(a) Cables for the underground primary service will be of a size and type as recommended by the Boston Edison Company and will be installed in fiber duct encased in concrete.

(b) Feeder cables, exclusive of the bus-duct feeders, will be of adequate size for the loads being served, will be type RHW, and will be installed in rigid conduit.

(c) Branch circuit wiring will be installed in rigid conduit and electrical metallic tubing. Cables will be type TW.

(d) Street lighting cables will be 2c#6, 600 volt, type RR installed in type II fiber duct, underground.

IV-11. BUS-DUCT

(a) Bus-duct for the tenant feeders will be of a size adequate for the loads being served, will be of either copper or aluminum bus, at the option of the Contractor, and will be of the plug-in type. Bus-duct will be installed with all required bends, terminals, fittings or other accessories.

(b) Switches used for the connection of panelboard circuits to the bus-duct at tenant electric rooms will be of adequate size for the loads being served and will be of a type which will readily plug into the bus-duct.

IV-12. STREET AND AREA LIGHTING

(a) Street and area lighting will be of the mercury lamp type of illumination.

(b) Lighting standards will be aluminum poles equipped with a six foot single bracket, transformer base, will allow a mounting height for the luminaire of 27 feet 8 inches, and will be similar and equal to General Electric design No. 277TLb.

(c) Luminaire will produce an IES Type III distribution, will be suitable for use with an H400-E1, mogul multiple socket lamp, and will be similar and equal to General Electric Form 400.

(d) Lamp ballast will be suitable for use with an H400-E1 mercury lamp, will operate on a 208 volt, single phase circuit, and will be located in the transformer base of the lighting standard.

(e) Street and area lighting circuits will be controlled by an astronomical time clock located in the basement electric room.

IV-13. EMERGENCY LIGHTING

(a) Emergency lighting units will be located in the corridors and stairways to provide emergency lighting for these areas.

(b) Units will be of the individual 6 volt, nickel-cadmium battery type, with double heads mounted on each unit.

(c) Units will be mounted on wall brackets, located approximately seven feet above floor and will be permanently connected with flexible conduit to wall outlet.

IV-14. TELEPHONE

(a) Empty conduits with surface mounted cabinets in the electric rooms, will be installed for the future installation of telephone cable and equipment by the telephone company.

(b) A main terminal cabinet will be located in the basement electric room with one-two inch conduit from this cabinet to the terminal cabinets in each tier of tenant electric rooms.

(c) Main terminal cabinet will be 36" x 24" x 6". Terminal cabinets in the tenant electric rooms will be 18" x 12" x 6".

All cabinets will be provided with 1/2" plywood backboards.

(d) Empty 1" conduits will be installed from the terminal cabinet in the tenant electric rooms to telephone outlets in the tenant quarters.

PART VIII - PRELIMINARY ENGINEERING COST ESTIMATE

Description	Unit	Quantity	Unit Cost	Eng. Cost Est.
PREPARATION OF SITE - EARTHWORK AND CLEANUP				
Excavation	C.Y.	24,025	$ .60	$ 14,415.00
Remove Surplus Material	C.Y.	10,000	.80	8,000.00
Building Gravel	C.Y.	500	1.80	900.00
Compacted Gravel	C.Y.	10,500	2.10	22,050.00
Sidewalk Gravel	C.Y.	540	2.10	1,134.00
Bituminous Parking Area	S.Y.	12,380	1.60	19,808.00
Bituminous Roads	S.Y.	6,500	2.10	13,650.00
Bituminous Loading Platform Ramp	S.Y.	5,000	2.10	10,500.00
Loam	C.Y.	275	3.00	825.00
Grade, Fertilize and Seed	S.Y.	4,150	.70	2,905.00
Exterior Storm Drain	L.S.			45,240.00
Exterior Water	L.S.			10,620.00
Exterior Sanitary	L.S.			5,700.00
Exterior-Gas Piping	L.S.			4,740.00
Concrete Walks	S.F.	37,350	.30	11,205.00
Paint Parking Lines	L.S.			300.00
			TOTAL (For 5 Buildings)	$ 171,992.00

$\frac{172,000}{5}$ = $34,400.00

TOTAL for 1 Building	$ 34,400.00
Say	$ 35,000.00

Description	Unit	Quantity	Unit Cost	Eng. Cost Est.
GRID FLAT SLAB (1/2 of 1 FLOOR)				
Columns	C.Y.	37	$ 55.00	$ 2,000.00
Beams	C.Y.	66	70.00	4,600.00
Grid Flat Slab	C.Y.	326	65.00	21,300.00
Face Brick	EA.	17,000	.20	3,400.00
8" Concrete Blocks	EA.	8,700	.90	7,800.00
4" Concrete Blocks	EA.	3,000	.70	2,100.00
Curtain Wall	S.F.	1,200	5.00	6,000.00
Sash	S.F.	800	3.00	2,400.00
Glass	S.F.	1,250	1.20	1,500.00
Stairs, Risers	EA.	40	45.00	1,800.00
Stairs, Landing	S.F.	64	6.00	400.00
Susp. Plaster Ceilings	S.Y.	90	9.00	800.00
Acoustic Tile Ceilings	S.F.	3,600	.80	2,900.00
Ceramic Tile Walls	S.F.	1,300	1.70	2,200.00
Ceramic Tile Floors	S.F.	780	1.40	1,100.00
Single Doors & Frames	EA.	24	125.00	3,000.00
Overhead Doors	EA.	3	800.00	2,400.00
Toilet Partitions	EA.	10	120.00	1,200.00
Asphalt Tile Flooring	S.F.	3,600	.70	2,500.00
Painting	LS.			4,000.00
Hardware	LS.			3,000.00
				$ 76,400.00
			Call	$ 76,500.00

76,500 x 2 = 153,000 per floor

Description	Unit	Quantity	Unit Cost	Eng. Cost Est.
BASEMENT				
CONCRETE				
Foundation Walls	C.Y.	350	$ 50.00	$ 17,500.00
Basement Floor	C.Y.	175	50.00	8,800.00
Columns & Piers	C.Y.	18	60.00	1,100.00
8" Concrete Block	EA.	4,800	.90	4,300.00
Stairs, Risers	EA.	36	45.00	1,600.00
Stairs, Landings	S.F.	64	6.00	400.00
Stairs to Boiler Room	L.S.			400.00
Single Doors & Frames	EA.	6	125.00	700.00
Double Doors & Frames	EA.	4	175.00	700.00
Painting	L.S.			1,000.00
Hardware	L.S.			900.00
				$ 37,400.00

Description	Unit	Quantity	Unit Cost	Eng. Cost Est.
ROOF - GRID FLAT SLAB				
Roof Slab	C.Y.	480	$ 65.00	$ 31,200.00
Beams	C.Y.	109	70.00	7,600.00
Canopy Roof Slab	C.Y.	45	60.00	2,700.00
Loading Platform	C.Y.	50	50.00	2,500.00
Roof Insulation	S.F.	25,600	.30	7,700.00
T & G Roofing	SQ.	269	32.00	8,600.00
Copper Gravel Stop	L.F.	1,354	1.50	2,000.00
Penthouses	L.S.			19,000.00
Miscellaneous Flashing	L.S.			500.00
				$ 81,800.00
MISCELLANEOUS ITEMS				
Entrance Doors	PR.	4	$ 700.00	$ 2,800.00
Limestone	S.F.	1,460	5.50	8,000.00
Lobby Stairs	RISER	6	90.00	500.00
Lobby	L.S.			2,000.00
Lobby Railing	L.S.			200.00
				$ 13,500.00

Description	Unit	Quantity	Unit Cost		Eng. Cost Est.
PLUMBING - 4 STORY BUILDING					
Roof Drainage	L.S.				$ 4,300.00
Gas Piping	L.S.				2,300.00
Cold Water Piping	L.S.				11,800.00
Hot Water Piping	L.S.				7,000.00
Hot Water Return Piping	L.S.				1,700.00
Sanitary	L.S.				17,000.00
Fixtures	L.S.				30,000.00
Equipment	L.S.				6,700.00
Accessories	L.S.				5,000.00
					$ 85,800.00
	10% Profit				8,580.00
					$ 94,380.00
	10% Overhead				9,440.00
	TOTAL PLUMBING COST				$ 103,820.00
				Say	$ 104,000.00
	Sprinkler Cost				$ 9,000.00

Description	Unit	Quantity	Unit Cost		Eng. Cost Est.
PLUMBING - 6 STORY BUILDING					
Roof Drainage	L.S.				$ 4,800.00
Gas Piping	L.S.				2,900.00
Cold Water Piping	L.S.				15,200.00
Hot Water Piping	L.S.				9,500.00
Hot Water Return Piping	L.S.				2,100.00
Sanitary & Vent	L.S.				22,000.00
Fixtures	L.S.				44,000.00
Equipment	L.S.				11,200.00
Accessories	L.S.				7,500.00
					$ 119,200.00
	10% Profit				11,920.00
					$ 131,120.00
	10% Overhead				13,120.00
	TOTAL PLUMBING COST				$ 144,240.00
				Say	$ 145,000.00
	Sprinkler Cost				$ 40,000.00

Description	Unit	Quantity	Unit Cost		Eng. Cost Est.
FIRE PROTECTION AND SPRINKLERS					
4 STORY BUILDING					
Sprinklers - Basement Only					
Area = $\frac{6,500 \text{ s.f.}}{100 \text{ s.f. per head}}$ = 65 Heads					
65 Heads $30. per head					
$1,950 - Say $3,000 incl. hydrants					$ 3,000.00
2-1/2" First aid standpipe with hose cabs & fire extinguishers					
say 4 units per floor and 2 in basement -					
Total = 18 @ $200.00 = $3,600.00					
Piping 2,000.00					
$5,600.00					$ 5,600.00
					$ 8,600.00
				Say	$ 9,000.00
6 STORY BUILDING					
Area = $\frac{161,600 \text{ s.f.}}{100 \text{ s.f. per head}}$ = 1,616 Heads					
1,616 Heads @ $25.00 per head =				Say	$ 40,000.00

Description	Unit	Quantity	Unit Cost	Eng. Cost Est.

HEATING AND VENTILATING - 4 STORY BUILDING

A. BUILDING HEATING SYSTEM

INCLUDES:

Supply & Return Steam Risers for Office Areas - L.S.				$ 300.00
Supply & Exhaust Duct Risers for Office Areas - L.S.				3,300.00
Supply & Return Steam Risers for Manufacturing Areas - L.S.				2,500.00
Supply & Return Duct Risers for Manufacturing Areas - L.S.				7,000.00
Condensate Meters & Basement Piping - L.S.				8,300.00
Exhaust Ducts for Toilets - L.S.				3,300.00
Unit Heaters & Piping for Heating of Manufacturing Areas - L.S.				22,300.00
Finned Radiation along the Perimeter of Office Areas - L.S.				20,000.00
Boiler Room Equipment & Piping & Oil Storage System - L.S.				20,000.00
				$ 87,000.00

B. MANUFACTURING AREAS VENTILATION

INCLUDES:

Air Handling Units, Ductwork and Diffusers - L.S.				$ 29,000.00
			TOTAL FOR BUILDING	$ 116,000.00

Description	Unit	Quantity	Unit Cost	Eng. Cost Est.

HEATING AND VENTILATING - 6 STORY BUILDING

A. BUILDING HEATING SYSTEM

INCLUDES:

Supply & Return Steam Risers for Office Areas - L.S.	$ 500.00
Supply & Exhaust Duct Risers for Office Areas - L.S.	4,900.00
Supply & Return Steam Risers for Manufacturing Areas - L.S.	4,900.00
Supply & Return Duct Risers for Manufacturing Areas - L.S.	9,500.00
Condensate Meters & Basement Piping - L.S.	9,800.00
Exhaust Ducts for Toilets - L.S.	4,300.00
Unit Heaters & Piping for Heating of Manufacturing Areas - L.S.	33,000.00
Finned Radiation along the Perimeter of Office Areas - L.S.	29,000.00
Boiler Room Equipment & Piping & Oil Storage System - L.S.	37,100.00
	$ 123,000.00

B. MANUFACTURING AREAS VENTILATION

INCLUDES:

Air Handling Units, Ductwork & Diffusers - L.S.	$ 46,000.00
TOTAL FOR BUILDING	$ 169,000.00

Description	Unit	Quantity	Unit Cost	Eng. Cost Est.
ELECTRIC WORK - 4 STORY BUILDING				
Electric Room	L.S.			$ 7,706.00
Boiler Room Feeder, etc.	L.S.			749.00
Basement Panel & Feeder	L.S.			267.00
Owner's Feeder Tenant Floors	L.S.			580.00
Owner's Lighting - Corridors, Stairs, Basement	L.S.			7,010.00
Elevators	L.S.			4,116.00
Tenant Feeders	L.S.			19,234.00
Tenant Area Lighting by Owner (to 22 ft. candles)	L.S.			44,928.00
				$ 84,590.00
			Say	$ 85,000.00
ELECTRIC WORK - 6 STORY BUILDING				
Electric Room	L.S.			$ 8,490.00
Boiler Room Feeder, etc.	L.S.			749.00
Basement Panel & Feeder	L.S.			267.00
Owner's Feeder - Tenant Floors	L.S.			785.00
Owner's Lighting, Corridors, Stairs, Basement	L.S.			9,493.00
Elevators	L.S.			4,469.00
Tenant Feeders	L.S.			28,687.00
Tenant Area Lighting by Owner (to 22 ft. candles)	L.S.			67,392.00
				$120,332.00
			Say	$120,000.00

Based on Gibson fixtures, 2 tube and uni-race plus office air conditioning.

Description	Unit	Quantity	Unit Cost	Eng. Cost Est.
COST SUMMARY - 4 STORY BUILDING - GRID FLAT SLAB				
Basement				$ 37,400.00
4 Floors @ $153,000.00				612,000.00
Roof, etc.				81,800.00
Miscellaneous Items				13,500.00
Movable Partitions				42,400.00
Elevators:				
4 Freight - $120,000.00				
2 Pass. - 60,000.00				
$180,000.00				180,000.00
Pile Foundations				146,400.00
Site Work				35,000.00
Plumbing				104,000.00
Fire Protection & Sprinklers				9,000.00
Electric				85,000.00
Heating & Ventilating				116,000.00
		TOTAL COST OF BUILDING		$1,472,500.00
			Call	$1,473,000.00

AREA OF BUILDING:

25,700 s.f. per floor

4 floors

102,800
6,500 (Basement)
900 Loading Platform
110,200 s.f. total

$$\frac{\$1,473,000.00}{110,200} = \$13.36 \text{ per s.f.}$$

Description	Unit	Quantity	Unit Cost	Eng. Cost Est.
COST SUMMARY - 6 STORY BUILDING - GRID FLAT SLAB				
Basement				$ 37,400.00
6 Floors @ $153,000.00				918,000.00
Roof, etc.				81,800.00
Miscellaneous Items				13,500.00
Movable Partitions				63,600.00
Elevators:				
4 Freight - $140,000.00				
2 Pass. - 72,000.00				
$212,000.00				212,000.00
Pile Foundations				195,200.00
Site Work				35,000.00
Plumbing				145,000.00
Fire Protection & Sprinklers				40,000.00
Electric				120,000.00
Heating & Ventilating				169,000.00
			TOTAL COST OF BUILDING	$ 2,030,500.00
			Call	$ 2,031,000.00

AREA OF BUILDING:

4 Story Building 110,200 s.f.
Add for 2 floors
2 x 25,700 s.f. = 51,400
161,600 s.f.

$$\frac{\$2,031,000.00}{161,600 \text{ s.f.}} = \$12.56 \text{ per s.f.}$$

Description	Unit	Quantity	Unit Cost	Eng. Cost Est.
COST SUMMARY - 4 STORY BUILDING - FLAT SLAB WITH DROP PANELS				
Basement				$ 37,400.00
4 Floors @ $156,500.00				626,000.00
Roof, etc.				82,840.00
Miscellaneous Items				13,500.00
Movable Partitions				42,400.00
Elevators				180,000.00
Pile Foundations				157,600.00
Site Work				35,000.00
Plumbing				104,000.00
Fire Protection & Sprinklers				9,000.00
Electric				85,000.00
Heating				116,000.00
			TOTAL COST OF BUILDING	$ 1,488,740.00
			Call	$ 1,489,000.00

$$\frac{\$1,489,000.00}{110,200 \text{ s.f.}} = \$13.51 \text{ per s.f.}$$

Description	Unit	Quantity	Unit Cost	Eng. Cost Est.
COST SUMMARY - 6 STORY BUILDING - FLAT SLAB WITH DROP PANELS				
Basement				$ 37,400.00
6 Floors @ $156,500.00				939,000.00
Roof, etc.				82,840.00
Miscellaneous Items				13,500.00
Movable Partitions				63,600.00
Elevators				212,000.00
Pile Foundations				208,000.00
Site Work				35,000.00
Plumbing				145,000.00
Fire Protection & Sprinklers				40,000.00
Electric				120,000.00
Heating				169,000.00
			TOTAL COST OF BUILDING	$ 2,065,340.00
			Call	$ 2,066,000.00

$$\frac{\$2,066,000.00}{161,600 \text{ s.f.}} = \$12.78 \text{ per s.f.}$$

COST ANALYSIS SHOWING PROPORTION OF TOTAL BUILDING COST ATTRIBUTABLE TO ELEVATORS, PILE FOUNDATIONS, SITE WORK, PLUMBING, FIRE PROTECTION AND SPRINKLERS, ELECTRIC, HEATING

	4 STORY FLAT SLAB	4 STORY GRID FLAT SLAB	6 STORY FLAT SLAB	6 STORY GRID FLAT SLAB
TOTAL COST	$1,489,000.	$1,473,000.	$2,066,000.	$2,031,000.
COST PER SQ. FT.	$ 13.51	$ 13.36	$ 12.78	$ 12.56
ELEVATORS)COST	$ 180,000.	$ 180,000.	$ 212,000.	$ 212,000.
)% of TOT.COST	12.1%	12.2%	10.3%	10.4%
)COST/S.F.OF BLDG.	1.63	1.63	1.31	1.31
PILE FOUNDATIONS)COST	$ 157,600.	$ 146,400.	$ 208,000.	$ 195,200.
)% of TOT.COST	10.6%	10.0%	10.1%	9.6%
)COST/S.F.OF BLDG.	1.43	1.33	1.29	1.21
SITE WORK)COST	$ 35,000.	$ 35,000.	$ 35,000.	$ 35,000.
)% of TOT.COST	2.35%	2.38%	1.69%	1.73%
)COST/S.F.OF BLDG.	.32	.32	.22	.22
PLUMBING)COST	$ 104,000.	$ 104,000.	$ 145,000.	$ 145,000.
)% of TOT. COST	7.0%	7.1%	7.0%	7.1%
)COST/S.F. OF BLDG.	.94	.94	.90	.90
FIRE PRO-)COST	$ 9,000.	$ 9,000.	$ 40,000.	$ 40,000.
TECTION &)% of TOT.COST	.6%	.6%	1.9%	2.0%
SPRINKLERS)COST/S.F.OF BLDG.	.08	.08	.25	.25
ELECTRIC)COST	$ 85,000.	$ 85,000.	$ 120,000.	$ 120,000.
)% of TOT.COST	5.7%	5.8%	5.8%	5.8%
)COST/S.F.OF BLDG.	.77	.77	.75	.75
HEATING)COST	$ 116,000.	$ 116,000.	$ 169,000.	$ 169,000.
)% of TOT.COST	7.8%	7.9%	8.2%	8.3%
)COST/S.F.OF BLDG.	1.05	1.05	1.05	1.05

PART IX - DEVELOPMENT FEASIBILITY

PREPARED BY: MR. DAVID H. BRADLEY, PRESIDENT
L. DAVENPORT BOYD, INC.
426 BOSTON POST ROAD
WESTON, MASSACHUSETTS

GENERAL FEASIBILITY REPORT

Although the general concept of an urban industrial park appears sound, in practicality it does not prove feasible. Despite the numerous benefits and advantages in making prime industrial space available in a downtown location, the one insurmountable barrier is the economic feasibility.

A separate section of this report analyzes the project cost factors and the income and expense factors, with full explanation of how they are developed. This section summarizes the combined conclusions of all the analyses and interviews.

Location

There is general agreement that a downtown location is desirable. The proximity to the labor market, the accessibility to mass transportation and to major traffic arteries, the central location for ease of distribution to all points in the metropolitan area, combine to create high demand for such a location. The desirability of these factors in combination, however, is not sufficiently unique to justify considerably higher costs and correspondingly higher rents.

Accessibility to mass transportation is provided today in many locations in the Boston area. Boston is fortunate in having one of the best rapid transit facilities in the country, so that there are numerous suburban or semi-suburban areas served by rapid transit and, therefore, can offer the same proximity to the labor market.

Already underway is a vast expansion of the rapid transit facilities, carrying high speed mass transportation to at least three additional locations along Route 128. This was made possible by the reorganization of the MTA into the Massachusetts Bay Transportation Authority. With these additional facilities and with the broader based financial support of 78 communities, there cannot fail to be made available additional competitive industrial sites.

Boston is also unique in having constructed its circumferencial highway first. All other major U. S. cities constructed the arterial highways first. But Boston, by starting with Route 128, created industrial and distribution locations that were equally accessible by highway to all sections of the Greater Boston area. As the highway program sees more of the arterial highways reaching completion, many additinnal sites in the greater metropolitan area can provide the accessibility to major highways that is so desirable to industrial and distribution facilities.

Competition

A downtown location becomes highly desirable if the locational factors referred to above are not generally available and therefore limits the competition. For instance, in Los Angeles where locational factors are extremely widespread and dissipated throughout the metropolitan area. This has inflated the price of good suburban locations unreasonably and depressed the price of industrial locations close to the urban core. Despite the depression of price on these sites and the general availability and the lack of competition, the cost of developing high-rise industrial units is still prohibitive; all of this in a much more favorable competitive atmosphere. For

further on this subject, please refer later in this report to interview summary with Mr. Daniel Wheeler of Cabot, Cabot & Forbes Co.

In Boston, the competitive factors are double edged. Suburban locations offer as good locational benefits and are competitive or lower in price. Existing urban locations are available at greatly reduced cost, albiet they do not offer the quality of space or the efficiency of operation. They do, however, offer the locational benefits of accessibility to - labor markets, arterial highways and rapid transportation. The higher costs of new high-rise industrial facilities cannot compete with the larger supply of low cost facilities available in Boston. (Refer to the separate list of comparable facilities available).

Building Cost

The prototype design developed by W. Chester Browne and Associates, Inc. appears to be the best and most efficient of its type. The building cost compares favorably with the findings of others who have done surveys of this type. The questions of material handling, vertical transportation, employee densities, floor loadings, and parking ratios are all difficult to solve in multi-tenanted speculative building, and therefore cannot be solved to universal satisfaction. General speaking, $13/sq.ft. for building cost of this type is as low as could be expected and variations in the above-mentioned factors would only serve to increase the price. This level of construction cost would generate a project cost of $15-$16/sq. ft. exclusive of land. Immediately, therefore, the rent schedules are non-competitive and the building is priced out of the market. This is without assigning any value to the land. To the extent that the land value is recognized, the pricing is, of course, even that much less competitive.

Land Values

In the Boston metropolitan area in a location of any competitive significance, it is safe to say that there are few locations where land is valued at less than $4/sq. ft. and this is being conservative. Therefore, the type of development and the value of the improvements should generate at least $4/sq. ft. of residual land value if this is to be a feasible program. However, in the interests of stimulating other economic factors, conceivable a price of say $2/sq. ft. might be reconciled in order to encourage a redevelopment program. Recognizing anything less than this would not be practical in developing a rental price, although well justified in order to provide the economic catalyst to stem blight, stimulate new development and generate higher tax revenue. A $2/sq. ft. land value would require a rent at the level of approximately $3.05/sq. ft. and this is competitively above the market.

Area Scheduling

It can be clearly documented that it would be extremely difficult to find suitable tenants for this proposed space in any adequate numbers to fully or even partially lease these facilities. There are only a few industries that might be particularly attracted to this location. Warehousing or light manufacturing are the obvious uses for the proposed space, largely because of the experience already demonstrated by competing locations. In each case the high rent structure, the difficulty of handling goods, and the general logistical inaccessibility for both raw materials and/or finished products would weigh heavily in favor of competing locations.

Please refer to separate report later in this report on interview with Metropolitan Area Planning Commission and the possible interest of the printing trades.

Summary

In general, the conclusions drawn from these studies are that industrial development of this area is not the highest and best use and would be quite difficult to justify in terms of cost rentability.

OPTIMUM PROJECT COST ANALYSIS FOR A SINGLE BUILDING

Construction Cost - 144,000 sq. ft./bldg. @ $13/sq. ft.	$1,872,000.
Site Preparation @ 10¢/sq. ft.	65,000.
Architectural & Engineering Fees - 6% of construction cost	112,000.
Interest During Construction - $\frac{\$2,000,000. \times 6\%}{2}$	60,000.
Insurance During Construction	8,000.
Real Estate Taxes During Construction	------
Sales & Promotion	110,000.
Legal Fees	5,000.
Development Management	35,000.
Financing Commitment	20,000.
Contingency	50,000.
TOTAL COST	$2,337,000.
Say	$2,340,000.

Project Cost Not Including Land - $16.20/sq. ft.

NOTES TO PROJECT COST ANALYSIS

Construction Cost

The best estimate to date is $13/sq. ft. However, this was done on the basis of unit costs only and with no allowance for inflationary factors during the time lapse between development of the plans and actual construction. $13/sq. ft. is a minimum. A more accurate range might be $13-$15/sq. ft.

Site Preparation

This item would include landscaping, paving, storm drains, curbs, gutters, exterior lighting, utility line tie-ins, etc. 10¢ a square foot is reasonable. On the basis that this might be high, we have prepared an alternative schedule using a total cost of $25,000 for this item.

A & E Fees

This item needs no comment but is standard.

Interest During Construction

This assumes a construction loan of $2,000,000 at an interest rate of 6% and a reasonable construction period of one year before takeout by the permanent financing.

Insurance During Construction

No comment.

Real Estate Taxes During Construction

It is assumed that negotiation could take place with the city whereby real estate taxes would be assessed only after completion.

Sales & Promotion

This is based on standard commission rates for the Boston Real Estate Board, assuming that brokerage will have to be paid for the leases negotiated.

Legal Fees

This item is designed to cover the cost of preparing leases and other legal documents necessary to both initiate and complete the project.

Financing Commitment

A mortgagee might reasonable charge a commitment fee of 1% of the mortgage.

Contingency

In any project there are expenses that cannot be anticipated in the beginning. This is money that will be spent but at the start it is not known where. A normal contingency factor is 5%. Here we are using only 2%.

MINIMUM PROJECT COST ANALYSIS FOR A SINGLE BUILDING

Construction Cost - 144,000 sq. ft. @ $13/sq. ft.	$1,872,000.
Site Preparation	25,000.
Architectural & Engineering Fees	90,000.
Interest During Construction - $\frac{\$2,000,000 \times 6\%}{2}$	60,000.
Real Estate Taxes	-----
Sales & Promotion	25,000.
Legal Fees	3,000.
Development Management	15,000.
Financing Commitment	-----
Contingency	40,000.
TOTAL COST	$2,130,000.

Project Cost Not Including Land - $14.80/sq. ft.

OPTIMUM EXPENSE ANALYSIS

Mortgage - $2,340,000 at 5-3/4% for 20 years - 8.5 constant	$190,000.
Operating Cost - heat, power, repairs & maintenance at $1/sq.ft.	144,000.
Management & Brokerage	20,000.
Taxes @ 23% of gross revenue	75,000.
Total Expenses Not Including Land	$429,000.
Land Value - $128,000 x 6% ($2/sq. ft.)	7,700.
Total Including Land	$436,700.

Proposed Rent - $3.05/sq. ft.

NOTES TO EXPENSE ANALYSIS

Mortgage

It is assumed that the developer would be able to obtain a mortgage equivalent to 100% of his project cost with the land providing the equity. This might be the equivalent of 90% conventional financing.

Operating Cost

Experience indicates that a typical operating cost for this type of building including heat, power, repairs and maintenance is $1/sq. ft. To show the range, however, on the minimum expense analysis we have adjusted this figure to 50¢ a foot.

Management & Brokerage

On any multi-tenanted building there will be a continuing management responsibility and also a continued brokerage responsibility as vacancies occur. This item is based on the standard real estate board rates.

Taxes

It is assumed that the formula developed by the city for new buildings would apply to this project and therefore 23% of gross revenue is used.

Vacancy Factor

On a multi-tenanted building, a vacancy factor should be considered. However, because of the nature of this type of facility, it is possible there would be no vacancies, and therefore in the maximum expense analysis we have eliminated this item. It should be pointed out, however, that if the program is not feasible, a much higher vacancy rate may be expected.

Land Values

For the purpose of this analysis, we have assumed land values in a range of $2-$4 per square foot, arbitrarily using for purposes of ground rent a 6% return on the land value as being sufficient. It should be pointed out that the projected rentals do not include anything beyond amortization of the debt and 6% return on the land as inducement to the entrepreneur. It is highly questionable that any developer would find this sufficient inducement to undertake this project. What this means, therefore, is that the B.R.A. would have to sell the land to a developer at a token rate of, say, $1.00/sq. ft. (or less) and then the developer would put the land value into his rental figure at an appreciated rate in order to gain sufficient incentive to undertake such a high risk program. Unless the rental rate reflects a land value of at least $2.00/sq. ft., it is doubtful that the program would be acceptable.

MAXIMUM EXPENSE ANALYSIS

Mortgage - $2,130,000 @ 5-3/4% for 20 years, 8.5 constant	$181,000.
Operating Cost - heat, power, maintenance & repairs @ $1/sq.ft.	144,000.
Taxes @ 23% gross income	75,000.
Management & Brokerage - 6%	20,000.
Vacancy Factor - 5%	18,000.
Total Expense Not Including Land	$438,000.
Land Value @ $240,000 x 6% ($4/sq. ft.)	14,400.
Total Including Land	$452,400.
Proposed Rent - $3.13/sq. ft.	

MINIMUM EXPENSE ANALYSIS

Mortgage - $2,130,000 @ 5-1/2% for 20 years, 8.26 constant		$175,000.
Operating Costs - heat, power, maintenance @ 50¢		75,000.
Management & Brokerage		20,000.
Taxes @ 23% gross		75,000.
Total Expense Not Including Land		$345,000.
Land Value @ $240,000 x 6% ($4/sq. ft.)		14,400.
Total Including Land		$359,400.
	Say	$360,000.

Proposed Rent - $2.50/sq. ft.

CONDOMINIUMS

In an interview with Mr. Graeme Elliott, partner of Ryan, Elliott & Co., Inc., industrial real estate brokers, several significant suggestions were made that might improve the feasibility.

First, he suggested the possibility of an industrial condominium. In this instance, a user might purchase title to the space he would use within the building. The use of his own capital and the return on that capital might make a higher rent more acceptable, or conversely the acceptance of a lower return on his capital investment might allow a lower rent. The latter situation could be reconciled on the basis that an owner-user might not see the same risk as a real estate developer and therefore would accept a lower return on his investment. He also would be able to mortgage his investment and take depreciation and even sell eventually. His investment would represent a hedge against inflation and remain constant with the economy. Of course, the disadvantages of ownership also go with the condominium.

Second, Graeme Elliott suggested the possibility of building in larger units, say at least 50,000 square feet per floor, in a 4-story building, or 200,000 square feet per building. The fallacy of this reasoning is in the fact that it assumes that with this size building substantial economies might be realized and construction costs might be lowered to $10 a square foot. Of course, this is assumed without regard to design concept or related problems. Our studies so far do not bear this out and, therefore, such assumption becomes invalid.

Continuing this assumption, however, a condominium type of ownership of 50,000 sq. ft. floors with $10 per square foot building, an analysis of expenses might be as follows:

Building Cost per Floor	$500,000.	
1st mortgage - 6% - 20 yrs.	400,000.	
Taxes @ 40¢/sq. ft.		$20,000.
Heat, maintenance & insurance 50¢/sq. ft.		25,000.
Mortgage interest - 6%		24,000.
Mortgage amortization - 3%		12,000.*
Return on equity - 6% x $100,000.		6,000.*
		$87,000.

*$18,000. represents return on equity investment and annual return of capital

$69,000. therefore is the cash rental equivalent

$87,000. = $1.74/sq. ft. gross rental

$69,000. = $1.38/sq. ft. cash rental

Further, all items except mortgage amortization and return on equity would be tax deductible and if the corporation was in the 50% bracket, this would help realize additional favorable reductions.

It is only this type of careful analysis and creative thinking that might perhaps bring this program close to practicality.

METROPOLITAN AREA PLANNING COMMISSION

Mr. John Culp, Assistant Director of the Metropolitan Area Planning Commission was most helpful in a one hour interview. It was his suggestion that perhaps an industry such as the printing trades would be most attracted by this type of development.

The printing trades by and large require an urban location. Proximity to the market is essential to maintain a competitive position and to give good service. Financial, legal, advertising artwork, reproduction, and other ancillary trades are located downtown and are vital to the printing industry.

The industry is not presently housed as a trade in an identifiable location. Old space is not particularly suited to the carrying out of this business. Efficiency of operation is most important. A number of efficiencies could be gained if as a trade they were to locate in one location. As a trade, also, he felt that they could perhaps pay a higher than normal rent to gain these benefits, and he was not perturbed by the prospect of a $2.50/ sq. ft. rent. Further investigation with the printing trade did indicate, however, that this would appear to be somewhat higher than printers feel they can now afford.

Mr. Culp seemed to feel that his Area Planning Commission could be most helpful in aiding and abetting an urban industrial park and was anxious to see it started. He felt that economies could be effected by Federal and State subsidies and that a start must be made if Boston is going to make any progress in clearing out its urban industrial blight and replacing the low-cost fully depreciated lofts, warehouses and semi-industrial facilities.

This report deals with the project only on a basis of competitive economic feasibility and not a subsidized basis.

The printing trades would be a prime candidate for the South End Industrial Park and should be explored fully.

DEPARTMENT OF PUBLIC WORKS

An interview with Mr. William Gittens of the Department of Public Works indicated that the Department of Public Works would be very much in support of such a development and would give its full co-operation to any developer who would undertake this program.

The street pattern in the area is such that there would be no major traffic difficulties. There is easy access to both Washington Street and Columbus Avenue for inter-neighborhood communication. The proposed Inner Belt will come sufficiently close to provide inter-city communication. The Inner Belt connection to the Central Artery and thence to Route 128 will provide unusual inter-regional communication.

Access to MBTA routes would undoubtedly mean that most employees would come to work via public transportation and therefore auto parking requirements would be minimized. Actually, the parking ratio suggested by the designer is approximately 1 to 1, which would appear to be ample. The Department of Public Works' only concern would be that off-street parking requirements be satisfied.

Off-street loading is provided and trucks making deliveries and pick-ups will find that the site provides easy access and egress.

Generally and specifically, the Department of Public Works would encourage an urban industrial development at this site.

SUMMARY OF INTERVIEW WITH DANIEL G. WHEELER, VICE PRESIDENT OF CABOT, CABOT & FORBES CO. - 12-5-65

It is interesting to note that Cabot, Cabot & Forbes Co., who have long been the exponents of the suburban industrial park and have successfully developed twenty-six such parks throughout the country, recently conducted their own analysis of the possibility of urban industrial parks. With the scarcity of land forcing developers further and further from central city with all the ensuing difficulties of transportation and distances, it seemed only logical to consider the possibility of locations in the urban core. Particularly should this be true in the sprawling megalopoli like New York City, Los Angeles and Chicago. In Los Angeles, for instance, the cost of urban land in the core city is relatively inexpensive. It has been by-passed in favor of suburban locations. Core city land, however, is never available in great quantities and therefore a more intense use of the land is necessary, and this can only be done by going to high-rise construction. Cabot, Cabot & Forbes found out that the best that can be done in construction cost of high-rise units is in the range of $13-$15/sq. ft. and this drives the rent figure up too high. But more important is the difficulty of solving the vertical transportation of goods in such units. There is no way to efficiently bring raw materials in and finished goods out when vertical transportation is necessary. Costs skyrocket and inefficiency becomes the key word. Cabot, Cabot & Forbes explored exterior ramps, large elevators or lifts that raise whole trucks or even freight cars, and also oversized interior elevators, but in each case cost increases were prohibitive.

In Mr. Wheeler's own words, he said that "Much as we recognize the need of bringing good warehousing or light manufacturing to central city, the inherent problems and costs are too great and we have at least for the moment abandoned the idea."

C O P Y

NEW ENGLAND MERCHANTS NATIONAL BANK

January 21, 1966

Mr. David H. Bradley, President
L. Davenport Boyd, Inc.
426 Boston Post Road
Weston, Massachusetts

Dear Mr. Bradley:

We sincerely appreciate your having taken the time to discuss with us the proposed South End Industrial Park, and, in particular, to review the economics of the project and its opportunity for financial success over the long term. The feasibility of high-rise industrial buildings has been a matter of interest to developers, urban renewal authorities, and the financing institutions of several cities; accordingly, we were happy to review with you the particular prospects as they might exist in the Greater Boston area.

You have indicated to us that the proposed buildings, five in number and six stories high, would probably require a gross rent of $2.50 per square foot and we believe this estimate to be approximately correct. The question then becomes whether or not property of this nature can be rented to tenants in large amounts in the City of Boston, and whether or not financial institutions would be willing to participate in the project?

As to the first issue, it would be our opinion that very few, if any, businesses could be found which would be willing and able to pay a gross rent of $2.50 for space in the South End Industrial Park. A great amount of upper floor space is now for rent in older multi-tenant, multi-storied properties in the Greater Boston area with gross rents between $.35 and $.75 per square foot.

While admittedly the properties involved at these lower rents are not of modern construction and design, it is, nevertheless, difficult to conclude that a prospective tenant would be willing to pay rent four or five times greater merely to obtain a more modern facility. The advantages of the proposed park simply are not sufficient to warrant, from the tenant's point of view, paying $2.50 instead of $.35 to $.75 per square foot. Tenants who occupy the older, lower-rent structures are for the most part unable to absorb such a dramatic rent increase and are businesses whose very economics are founded upon the ability to operate in a low-rent location.

C O P Y

NEW ENGLAND MERCHANTS NATIONAL BANK

In the City of Boston, even first floor manufacturing space is available today at $1.00 to $1.50 per square foot in older buildings and since there are no advantages to a tenant in moving into the upper floors of a multi-story building, we see no reason for a firm, whose operation might require first floor space, to be attracted to a new multi-story building with a higher rent.

Business firms located in the industrial park on Route 128 are not likely to be attracted to the high-rise facilities for they have chosen to be located on the outskirts to avoid the disadvantages of a downtown location, specifically, congestion, unattractive surroundings, noise, etc. While the gross rent to these firms may be approximately the same in the high-rise property as in the industrial parks, the firms have already made the decision that they are willing to forego the advantages of a centralized location in exchange for, to them, the specific advantages and attractiveness of the typical suburban industrial park. Accordingly, we find it very difficult indeed to conceive of any firm which would be willing to occupy the proposed high-rise properties on a long term basis.

As to financing of the projects by institutional lenders, we believe the difficulty, or even the impossibility, of obtaining lease commitments after its completion is so serious as to preclude the possibility of obtaining institutional financing except, of course, as leases may be signed in advance of construction; as we have noted, we think it unlikely that many such long term tenants can be found.

I do not know whether you would agree with our conclusions, but, for our part, we do sincerely believe that the project would not be successful.

Very truly yours,

Robert S. Swain, Jr. /s/

Robert S. Swain, Jr. /t/
Assistant Vice President

RSS:pmn

C O P Y

RYAN, ELLIOTT and COMPANY, INC.

140 Federal Street, Boston 10, Massachusetts

February 16, 1966

Mr. David Bradley
L. Davenport Boyd Inc.
426 Boston Post Road
Weston, Massachusetts

Dear Dave:

The following spaces have been offered in the Boston area. They are for the most part, one floor, industrial spaces in multiple tenant buildings and the rentals quoted include taxes and heat.

Fargo Building - 451 D Street, South Boston

24,000 square feet per floor
$0.70 to $0.85 per square foot

1360 Commonwealth Avenue, Allston

21,000 square feet, second floor
$1.10 per square foot

1000 Washington Street, (New York Street area)

20,000 square feet per floor
$1.25 per square foot - whole floor

Any space in the $0.50 square foot range would be older and not comparable. Space in the $1.50 to $2.00 range would be new, with one-story, on its own land or with considerable air conditioned office space. Thus, the range we are talking about runs $0.75 to $1.25 per square foot for existing property.

I hope this is helpful.

Very sincerely,

Graeme /s/

Graeme Elliott /t/

GE:ga

C O P Y

THE FIRST NATIONAL BANK OF BOSTON

Boston, Massachusetts 02106

William F. Keesler
Senior Vice President

January 13, 1965

Mr. W. Chester Browne, President
W. Chester Browne & Associates, Inc.
122-128 Arlington Street
Boston, Massachusetts 02116

Dear Mr. Browne:

Some time ago, you sent me a summary of a feasibility study on project #73962 for the B.R.A. This relates mainly to the market for multi-storied light manufacturing buildings that might be developed in the City of Boston. I apologize for not having replied earlier but due to travel schedules I have really not had sufficient time to give the matter the thought to which it is entitled. As you requested, I am now enclosing the questionnaire answered to the best of my ability based on the information furnished. I think the major factors are price per square foot for the tenant and parking space for employees. We do have instances in Boston where there is upper floor space in pretty good buildings that can be rented for considerably less than the $2.25 per square foot mentioned in the summary. In some of these cases, one of the major problems is that there is not sufficient parking space for employees. In spite of mass transportation, it seems that more and more employees are traveling to their work by car and I have felt that we are almost reaching the time when parking is almost as necessary, in connection with an industrial building, as it is for a supermarket. Unless the space therefor is created where land is pretty cheap and taxes are low, the over-all cost to the tenant is too high-priced per square foot.

Thank you for sending to me the summary and I hope the above and my answers to the questionnaire will be of some aid to your consideration of the problem.

Sincerely yours,

William F. Keesler /s/

Senior Vice President

C O P Y

G R E A T E R B O S T O N

CHAMBER OF COMMERCE

125 High St., Boston 10, Mass.

December 14, 1964

Mr. W. Chester Browne, President
Chester Browne and Associates, Inc.
122-128 Arlington Street
Boston, Massachusetts

Dear Mr. Browne:

I appreciate this opportunity to comment and answer the questionnaire on the feasibility study submitted to the Greater Boston Chamber of Commerce.

Since the advent of urban renewal in Boston, the Chamber's economic growth and industrial development programs have been concerned about the lack of attention given to the industrial location needs of the City. During the same period, industry has been displaced by the Central Artery, the Government Center, the Massachusetts Turnpike Extension and the soon-to-be Waterfront Redevelopment program. More of the same is indicated for the future with the Central Business District project. This situation has thwarted the industrial growth in the Core City.

Another interesting observation is that, in terms of numbers of electronic and research and development companies, Boston and Cambridge can claim the majority versus the cities and towns adjacent to route 128. These companies need space to move into and grow in the future, otherwise they will seek industrial park space outside these two cities.

During the past few years, some thought has been given to construct industrial and commercial facilities for specific activities such as: a graphic arts center, and a science center. In each center, special services would be offered to the companies to attract them to such centers. These particular industries are currently spread around in various locations which are within the City. This idea has many merits.

C O P Y

Mr. W. Chester Browne, President--2
December 14, 1964

The Research and Development Department of the Chamber has had a number of industrial location situations where the company involved would prefer to remain in the city, but no suitable facilities were available.

It is interesting to note that Cambridge has set aside a 14-acre tract as a part of the NASA Center -- Kendall Square urban renewal site. The Boston Redevelopment Authority should follow a similar plan where feasible.

I have taken the liberty of enclosing a department brochure describing the Chamber's industrial development program. In the conduct of the program, the Industrial Affairs Committee contacts 50 companies per month regarding their individual needs. Most of the opinions expressed are the result of these interviews during this year.

At this time, the Chamber is very interested in the problems of Boston and is holding discussions with City officials on this subject. This proposal certainly has significant merit and both the Boston Redevelopment Authority and W. Chester Browne and Associates, Inc. are to be complimented for this work.

Sincerely,

TLM:hc
Enclosures

Thomas L. McGrath, Manager
Research and Development Department

INTERVIEWS AND SUMMARY OPINIONS

It is interesting to note that our own personal opinion at the start of this report was quite in favor of the practicality of this program. It seemed not only practical but quite necessary if we are to bring industry closer to the urban core. More intense use of land would be absolutely essential. The more people we consulted, however, the more we recognized the impracticality in terms of cost. Perhaps rather than impractical, it is more premature. The day will come some time when shortage of supply of good land and demand for this type of location will force users to support these prices. At the moment though, there is unanimous feeling that rents of $2.25 to $2.50 per square foot cannot be obtained and that it would only serve to continue to force industry to the suburbs.

Other than these interviews and letters specifically included in this report, the following prominent authorities were consulted:

Mark Wheeler, President, New England Merchants National Bank

Everett Pope, President, Workingmens Co-operative Bank

Gerald W. Blakeley, President, Cabot, Cabot & Forbes Co.

Thomas Horan, President, Meredith & Grew

Charles H. Spaulding, Executive Vice President, Cabot, Cabot & Forbes Co.

King Upton, Sr., Vice President, First National Bank of Boston

Arthur L. Moseley, Jr., Industrial Broker

John Ryan, Ryan, Elliott & Co., Inc.

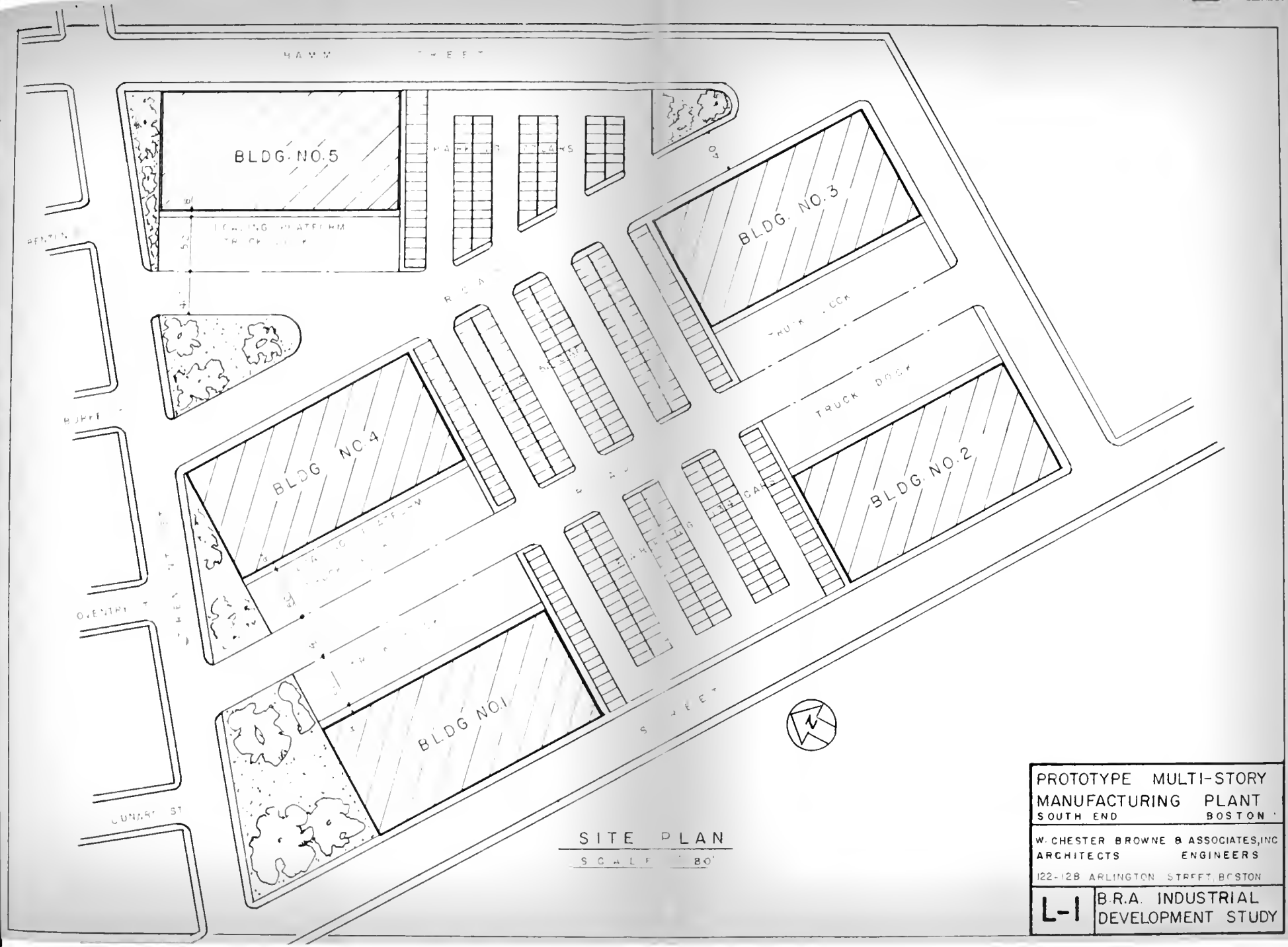
William Coughlin, Ryan, Elliott & Co., Inc.

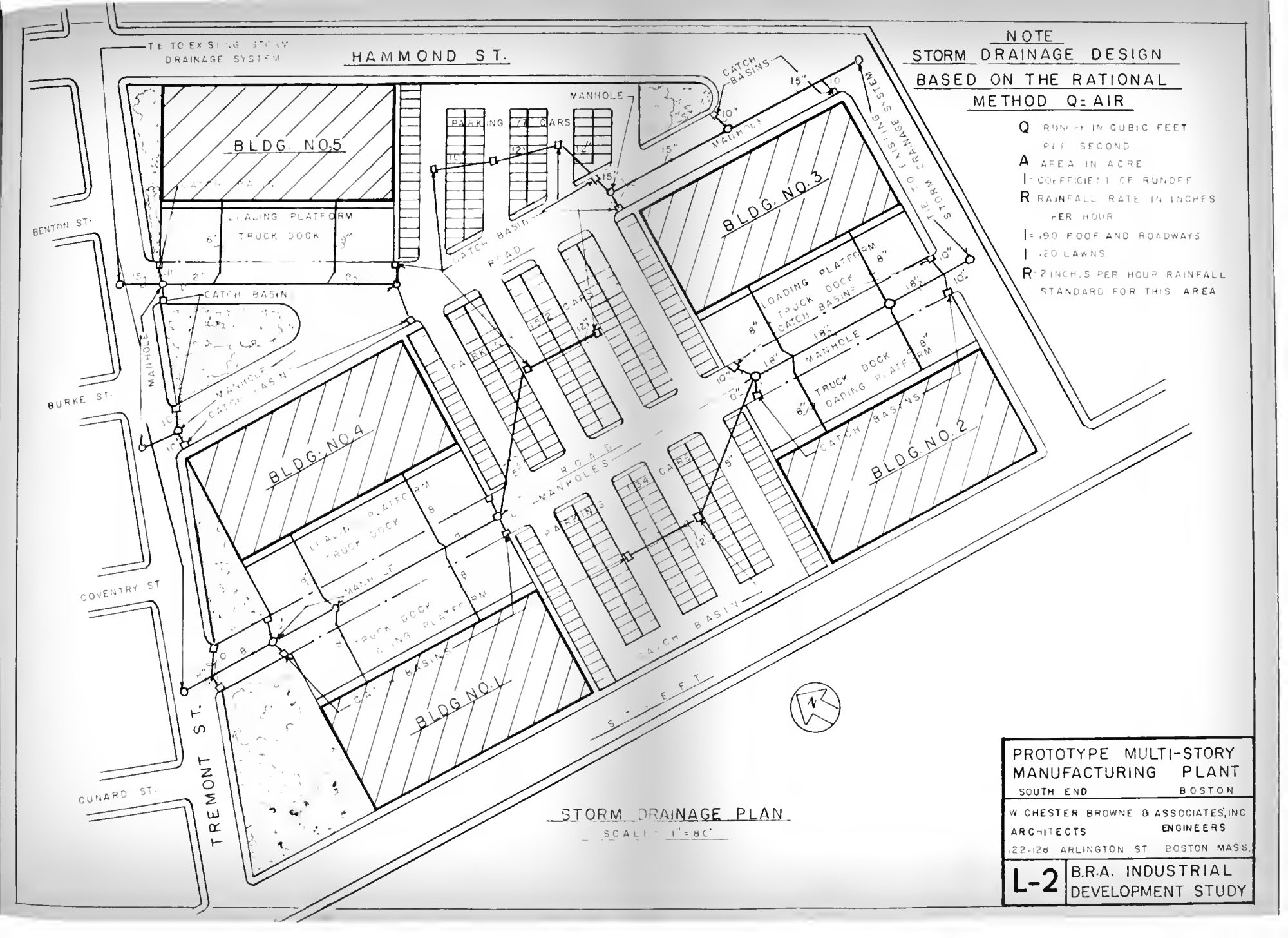
John Phillips, Vice President, Eastern Gas & Fuel

Thomas Galligan, Executive Vice President, Boston Edison Co.

Sydney Dean, former Vice President, New England Mutual Life Insurance Co.

The summary opinion of this distinguished list is that although this is a wonderful concept the key is price per square foot, and that rents in the range necessary to support those costs are not obtainable.


BLDG. NO.5
BLDG. NO.3
BLDG NO.4
BLDG NO.2
BLDG NO.1
TRUCK DOCK
TRUCK DOCK
LOADING PLATFORM
LOADING PLATFORM
BENTON
BUHRE
ORIENTAL
LUNARY ST
SITE PLAN
SCALE 80'
PROTOTYPE MULTI-STORY
MANUFACTURING PLANT
SOUTH END BOSTON
W. CHESTER BROWNE & ASSOCIATES, INC
ARCHITECTS ENGINEERS
122-128 ARLINGTON STREET, BOSTON
L-1
B.R.A. INDUSTRIAL
DEVELOPMENT STUDY



NOTE

STORM DRAINAGE DESIGN BASED ON THE RATIONAL METHOD Q= AIR

Q RUNOFF IN CUBIC FEET PER SECOND

A AREA IN ACRE

I COEFFICIENT OF RUNOFF

R RAINFALL RATE IN INCHES PER HOUR

I = .90 ROOF AND ROADWAYS

I = .20 LAWNS

R = 2 INCHES PER HOUR RAINFALL STANDARD FOR THIS AREA

PROTOTYPE MULTI-STORY MANUFACTURING PLANT

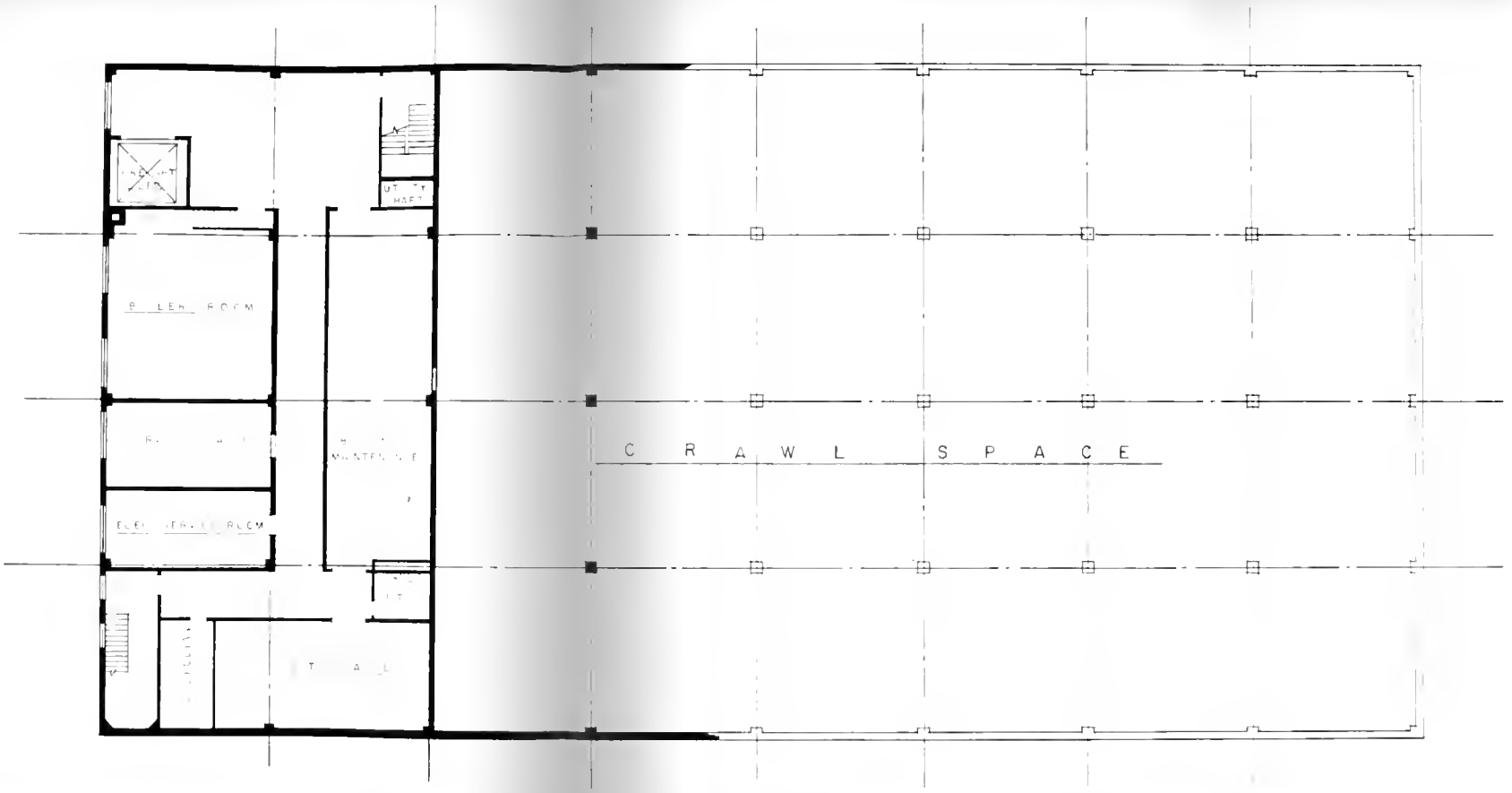
SOUTH END BOSTON

W CHESTER BROWNE & ASSOCIATES, INC

ARCHITECTS ENGINEERS

122-126 ARLINGTON ST BOSTON MASS.

L-2 B.R.A. INDUSTRIAL DEVELOPMENT STUDY



SCHEME "A"

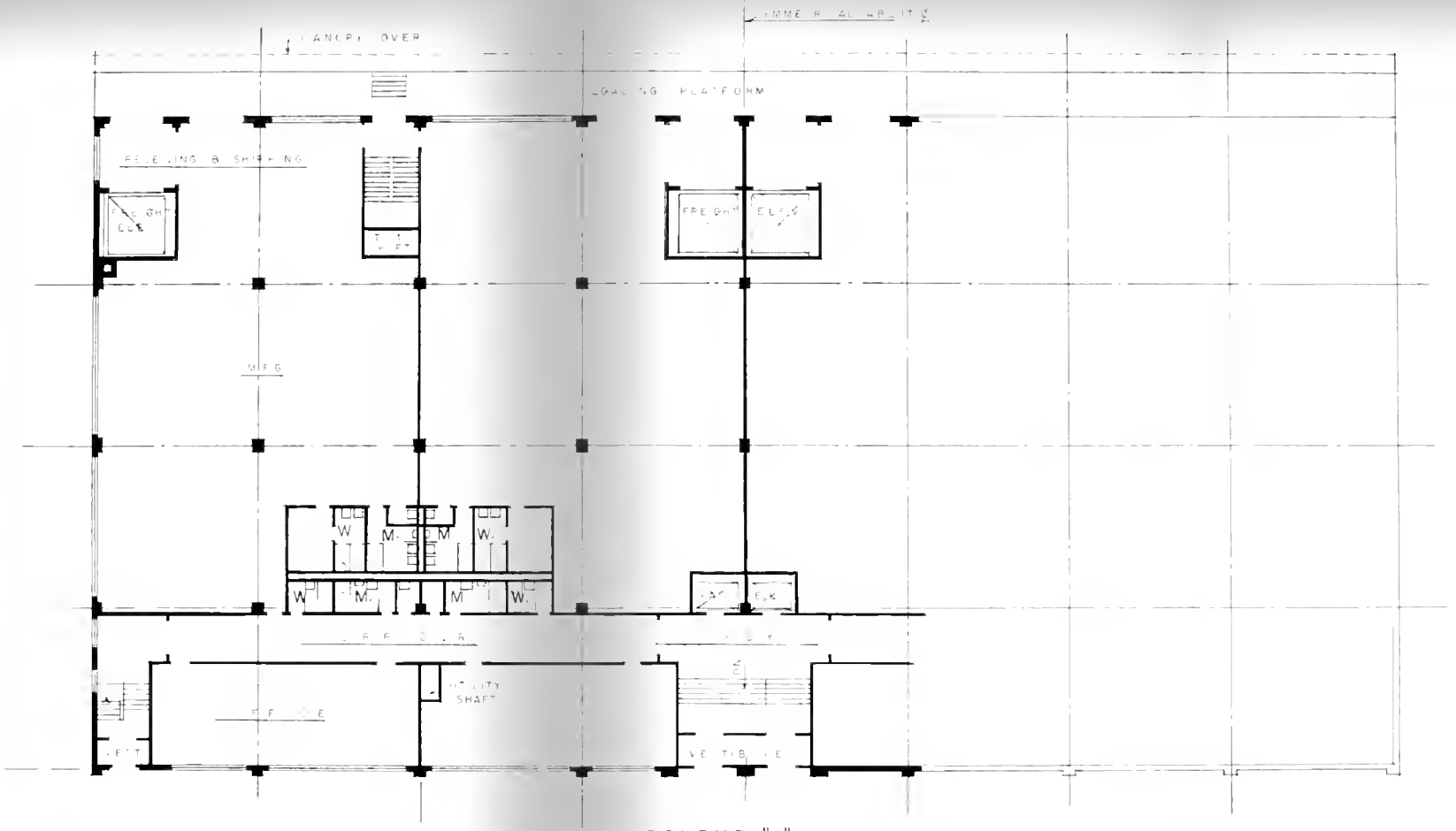
BASEMENT PLAN

SCALE 1/16 1-0

PROTOTYPE MULTI-STORY MANUFACTURING PLANT
SOUTH END BOSTON

W. CHESTER BROWNE & ASSOCIATES, INC.
ARCHITECTS ENGINEERS
222-228 ARLINGTON ST. BOSTON, MASS.

A-1 B.R.A. INDUSTRIAL DEVELOPMENT STUDY



SCHEME "A"

GROUND FLOOR PLAN

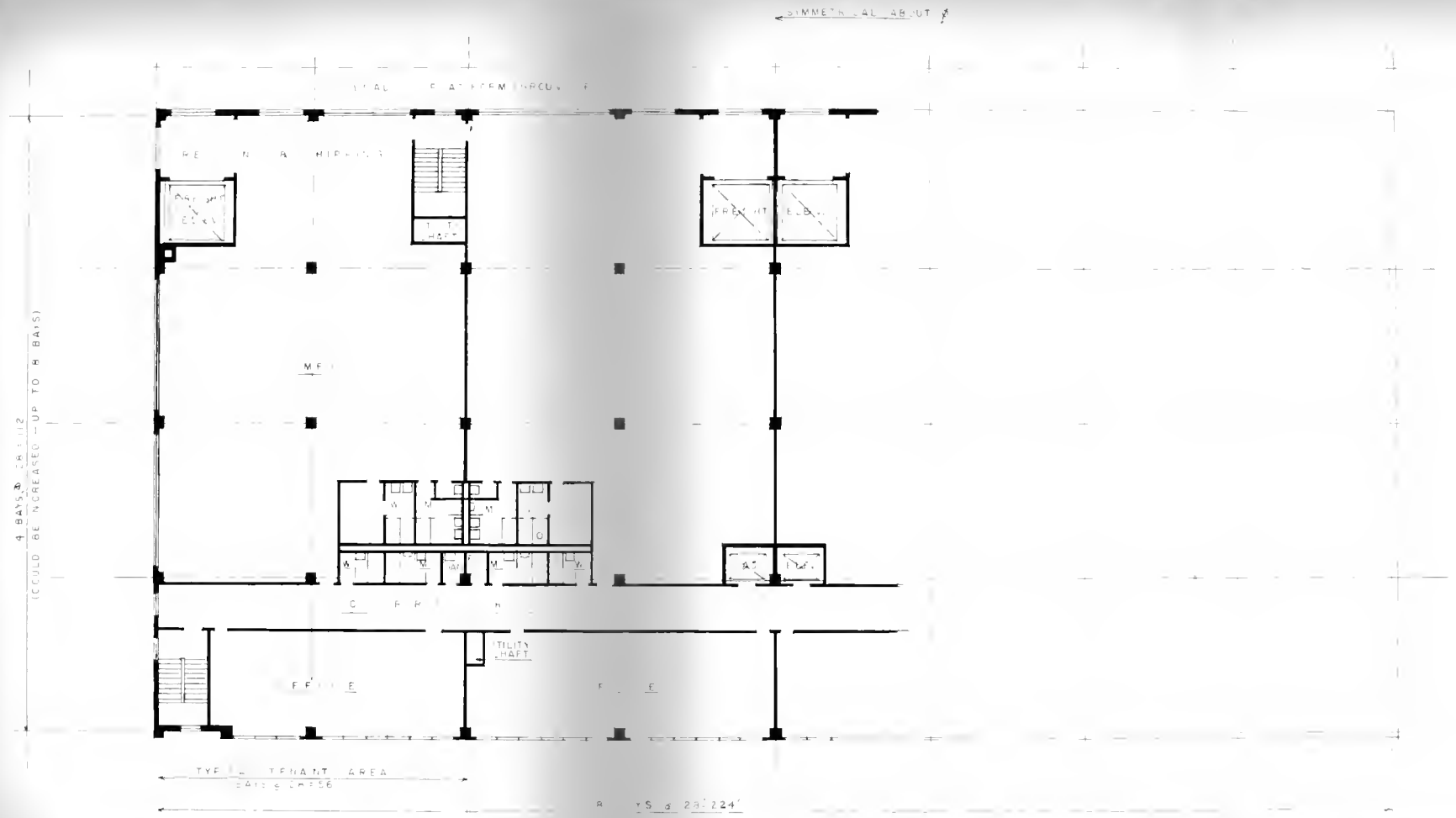
SCALE 1/8" = 1'-0"

PROTOTYPE MULTI-STORY MANUFACTURING PLANT

W CHESTER BROWNE & ASSOCIATES, INC

ARCHITECTS ENGINEERS

A-2 | B.R.A. INDUSTRIAL DEVELOPMENT STUDY



SCHEME "A"

TYPICAL FLOOR PLAN

SCALE 1/16"=1'-0"

PROTOTYPE MULTI-STORY MANUFACTURING PLANT

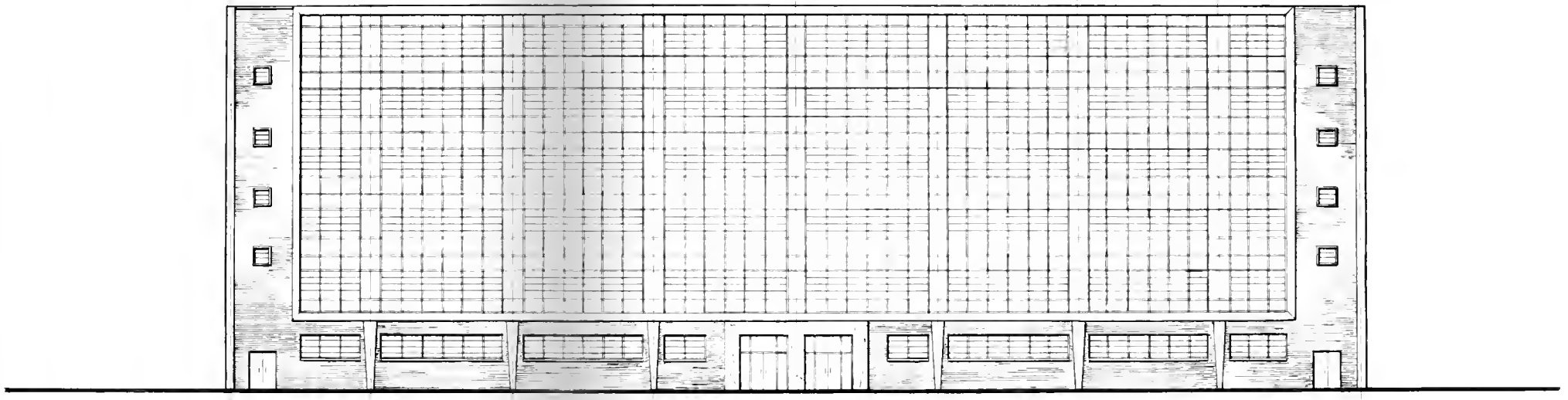
TH END BOSTON

WORCESTER BROWNE & ASSOCIATES, INC.

ARCHITECTS ENGINEERS

22 26 ARLINGTON ST. BOSTON

A-3 B.R.A. INDUSTRIAL DEVELOPMENT STUDY



SCHEME "A" & "B"

FRONT ELEVATION

SCALE 1/16" = 1'-0"

(6 STORIES)

PROTOTYPE MULTI-STORY MANUFACTURING PLANT

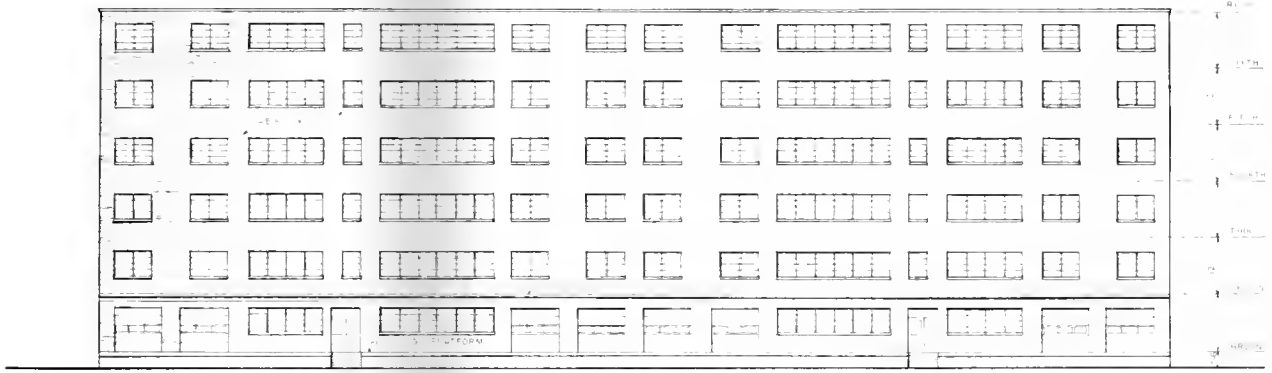
SOUTH END BOSTON

W. CHESTER BROWNE & ASSOCIATES, INC.

ARCHITECTS ENGINEERS

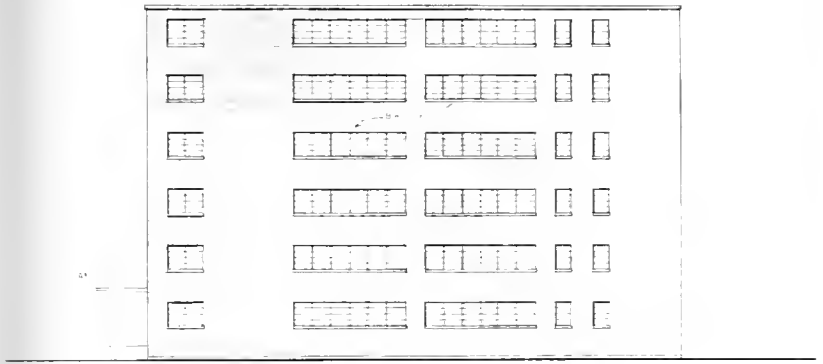
122-128 ARLINGTON ST. BOSTON

A-4 B.R.A. INDUSTRIAL DEVELOPMENT STUDY



REAR ELEVATION

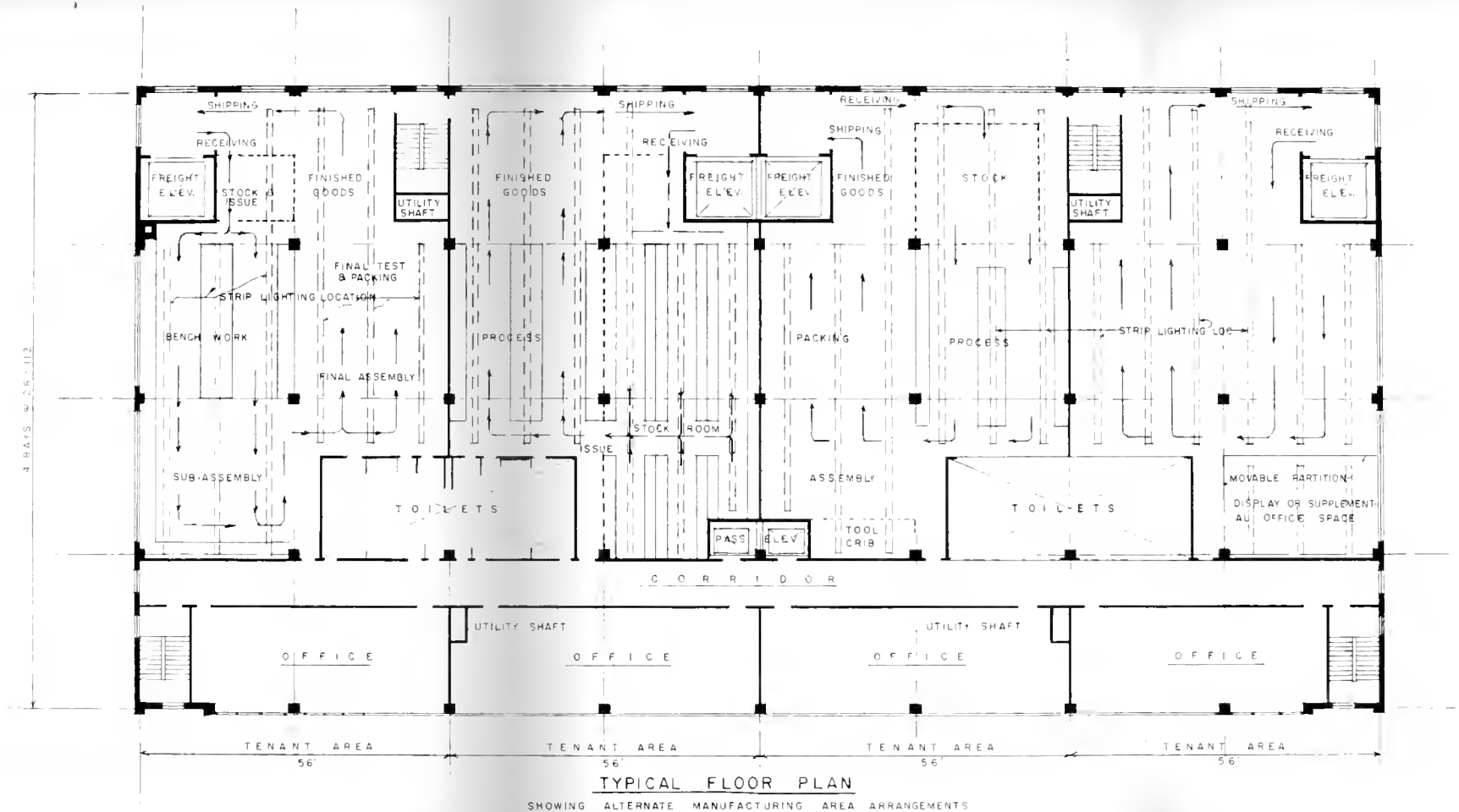
SCHEME "A"



SIDE ELEVATION

PROTOTYPE MULTI-STORY MANUFACTURING PLANT

A-5 BRA INDUSTRIAL DEVELOPMENT STUDY



TYPICAL FLOOR PLAN

SHOWING ALTERNATE MANUFACTURING AREA ARRANGEMENTS

SCALE 1/8"=1'-0

ARROWS INDICATE WORK FLOW

MOVABLE WIRE MESH PARTITIONS SHOWN THUS - - - - - -

PROTOTYPE MULTI-STORY MANUFACTURING PLANT

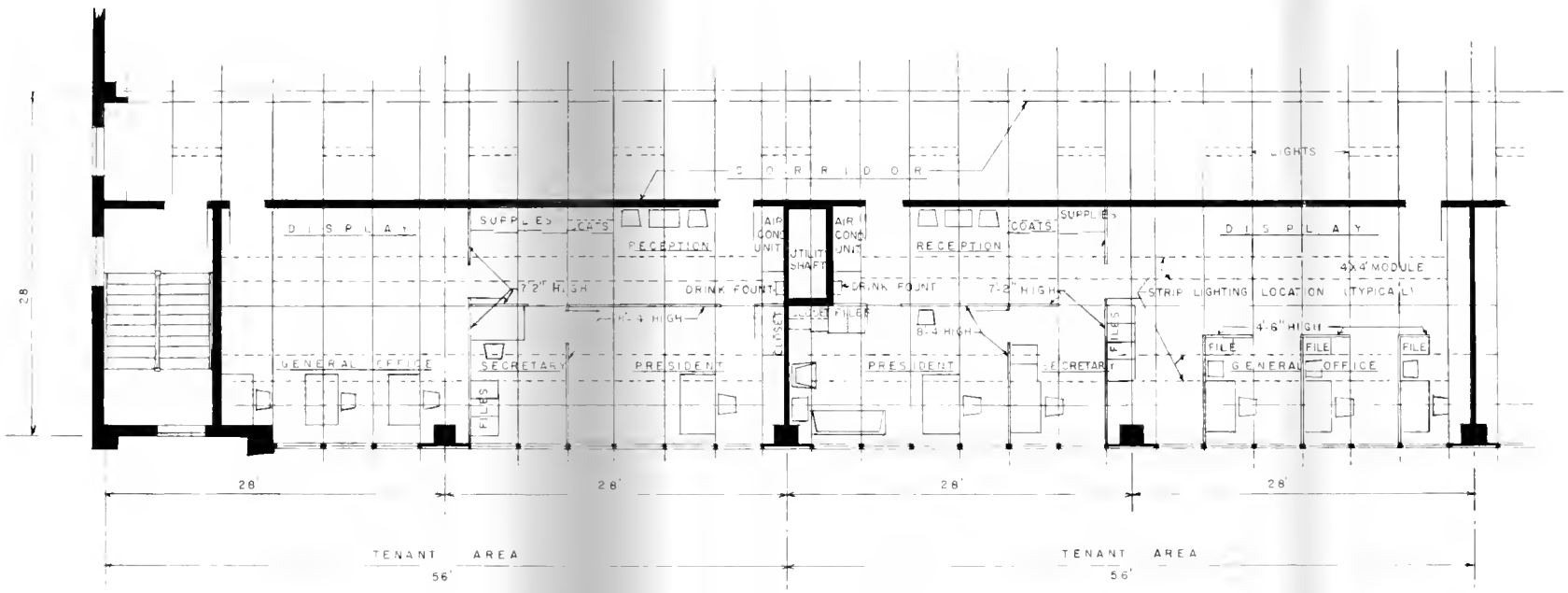
SOUTH END BOSTON

W. CHESTER BROWNE & ASSOCIATES, INC.

ARCHITECTS ENGINEERS

122-128 ARLINGTON ST. BOSTON

A-6 B.R.A. INDUSTRIAL DEVELOPMENT STUDY



PROPOSED OFFICE ARRANGEMENT

SCALE . 1/8"= 1'-0"

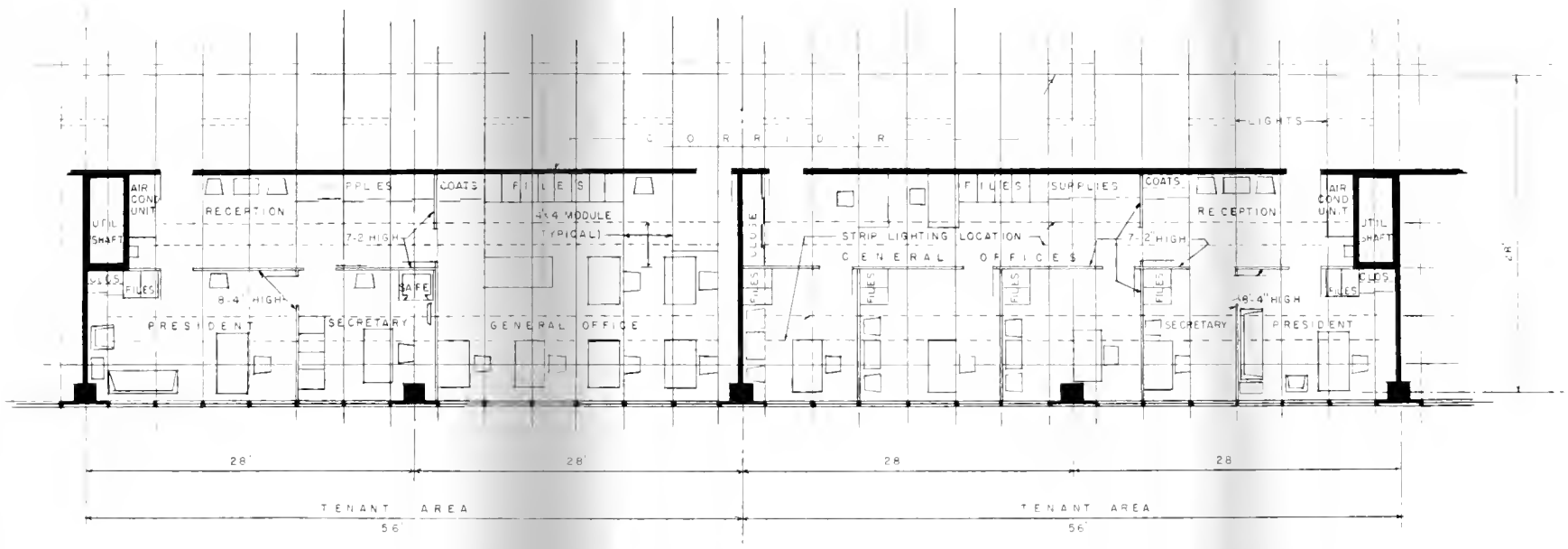
PERMANENT PARTITIONS SHOWN SOLID — ALL OTHERS MOVABLE

CEILINGS IN CORRIDOR & OFFICE AREAS ARE 8'-4" HIGH, SUSPENDED, REMOVABLE ACOUSTICAL PANELS

PROTOTYPE MULTI-STORY MANUFACTURING PLANT
SOUTH END BOSTON

W. CHESTER BROWNE & ASSOCIATES, INC
ARCHITECTS ENGINEERS
22-128 ARLINGTON ST BOSTON

A-7 B.R.A. INDUSTRIAL DEVELOPMENT STUDY



ALTERNATE OFFICE ARRANGEMENT

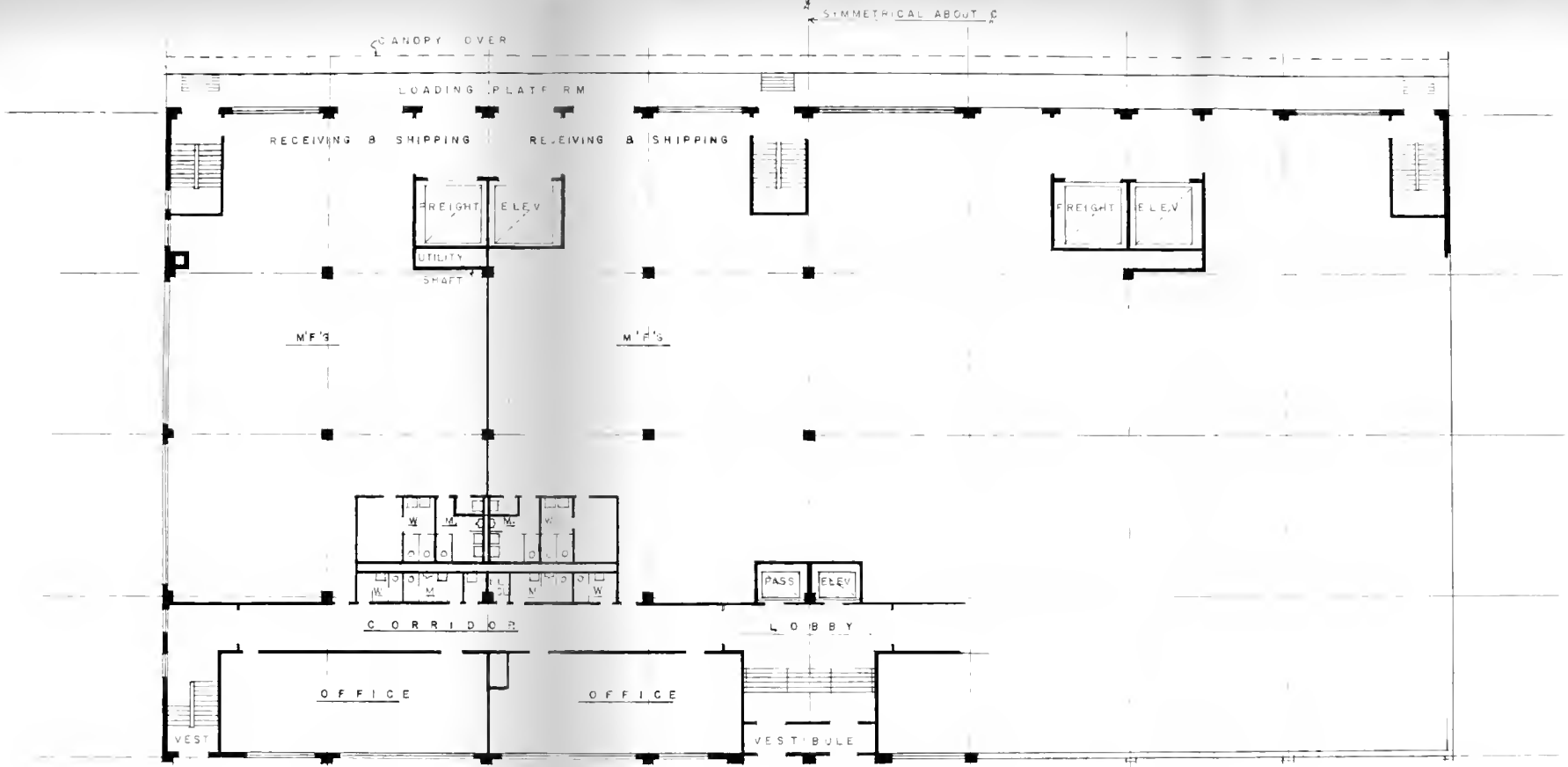
SCALE: 1/8"-1'-0"

PERMANENT PARTITIONS SHOWN SOLID - ALL OTHERS MOVABLE
CEILINGS IN CORRIDOR & OFFICE AREAS ARE 8'-4" HIGH, SUSPENDED, REMOVABLE ACOUSTICAL PANELS

PROTOTYPE MULTI-STORY MANUFACTURING PLANT
E. I. H. END BOSTON

WORCHESTER BRYANT & ASSOCIATES INC.
ARCHITECTS ENGINEERS
122-128 ARLINGTON ST. BOSTON

A-8 B.R.A. INDUSTRIAL DEVELOPMENT STUDY



SCHEME-"B"

GROUND FLOOR PLAN

SCALE 1/16"=1'-0"

NOTE

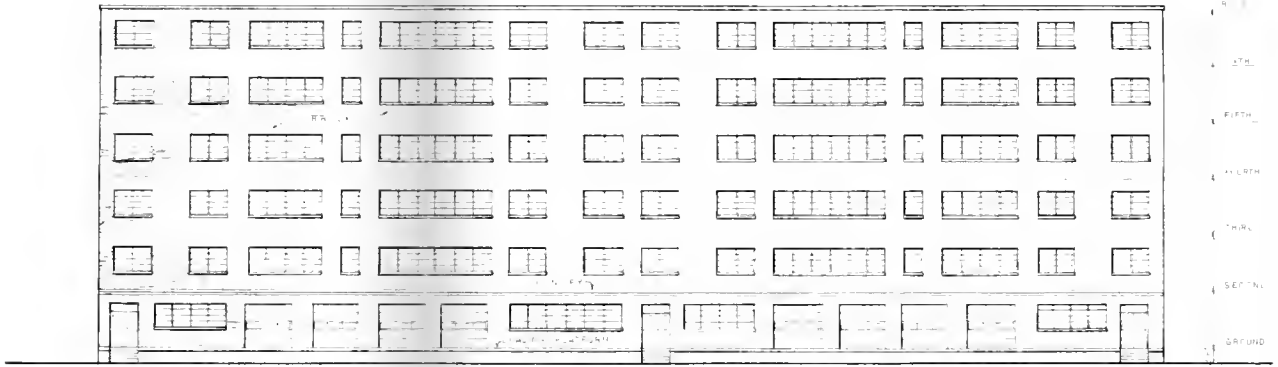
TYPICAL FLOOR PLAN FOR SCHEME 'B'
SIMILAR TO SCHEME 'A' FLOOR PLAN

PROTOTYPE MULTI-STORY MANUFACTURING PLANT
SOUTH END BOSTON

WORCHESTER BROWNE & ASSOCIATES, INC.
ARCHITECTS ENGINEERS
22-128 ARLINGTON ST. BOSTON

A-9

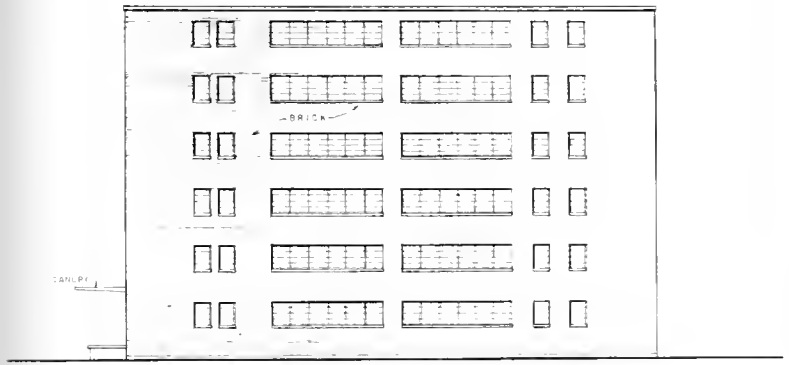
B.R.A. INDUSTRIAL DEVELOPMENT STUDY



REAR ELEVATION

SCALE 1/16"=1'-0"

SCHEME "B"



SIDE ELEVATION

SCALE 1/16"=1'-0"

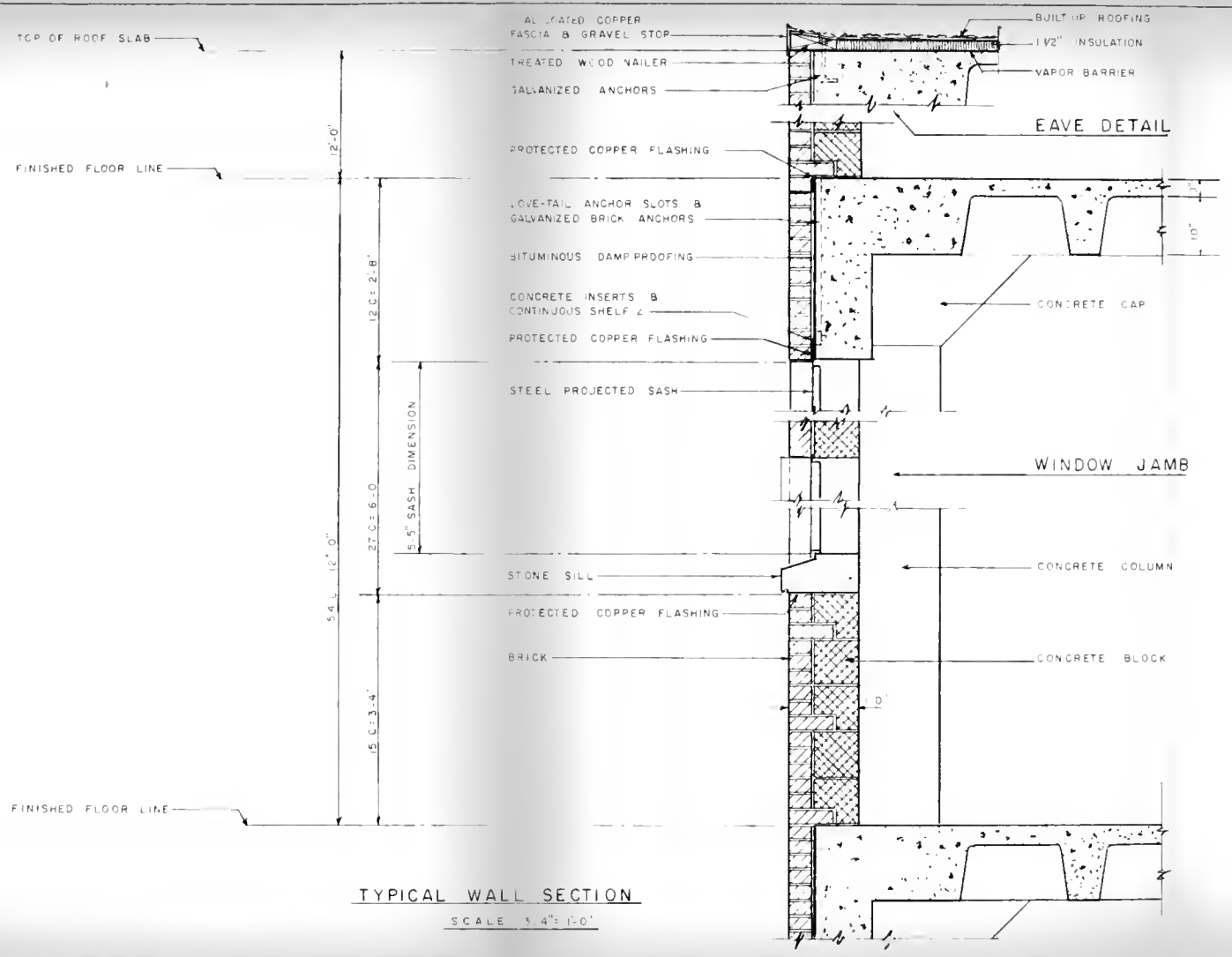
PROTOTYPE MULT.-STORY MANUFACTURING PLANT

[illegible] BOSTON

[illegible] BROWNE & ASSOCIATES, INC.
ARCHITECTS ENGINEERS

[illegible] ARLINGTON [illegible]

A-10 B.R.A. INDUSTRIAL DEVELOPMENT STUDY



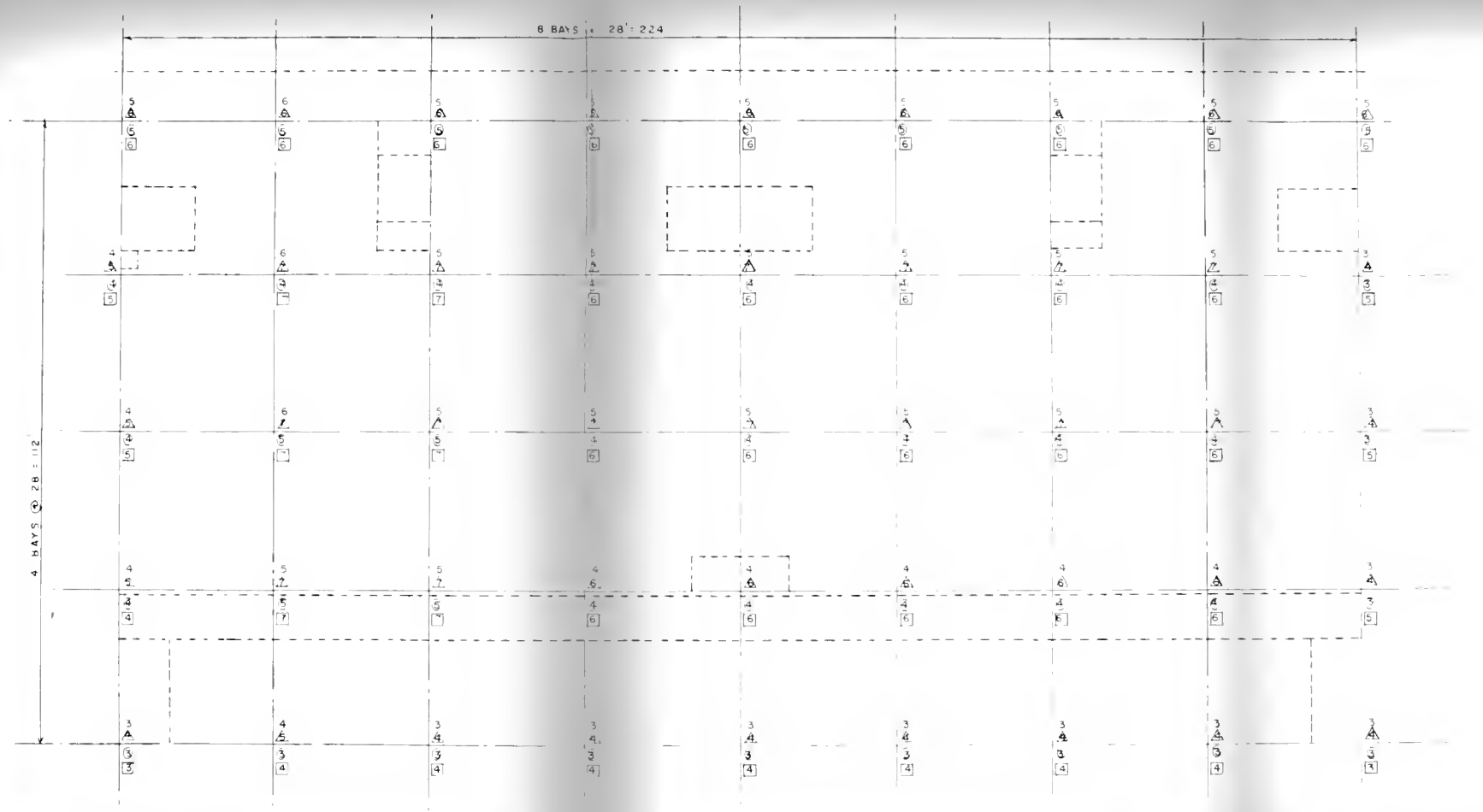
TYPICAL WALL SECTION

SCALE 3/4"= 1'-0"

PROTOTYPE MULTI-STORY MANUFACTURING PLANT
SOUTH END BOSTON

W. CHESTER BRCANE & ASSOCIATES, INC.
ARCHITECTS ENGINEERS
28 ARLINGTON ST. BOSTON

A-11 B.R.A. INDUSTRIAL DEVELOPMENT STUDY



SCALE 1/16" = 1'-0"

FIGURES SHOWN THUS - 6 INDICATE NUMBER OF PILES FOR A 4 STORY FLAT SLAB BUILDING AT EACH COLUMN LOCATION

" " " 6 " " " " " " " " " " "

" " " 4 " " " " " " " " " " "

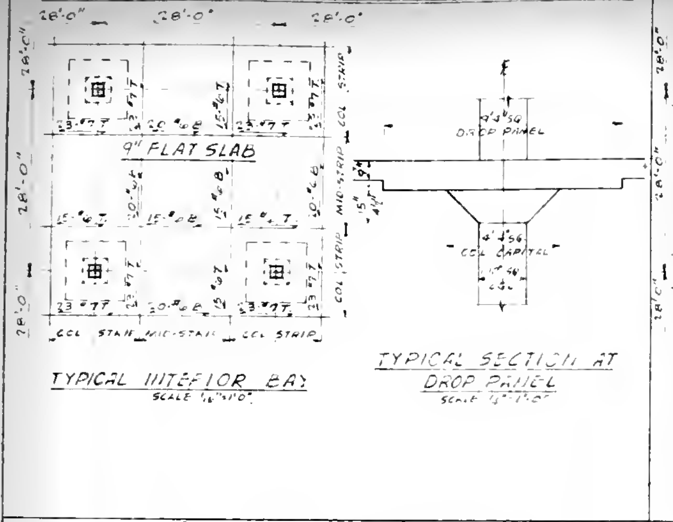
" " " 6 GRID FLAT SLAB " " " " " " " "

PROTOTYPE MULTI-STORY MANUFACTURING PLANT
SOUTH END BOSTON

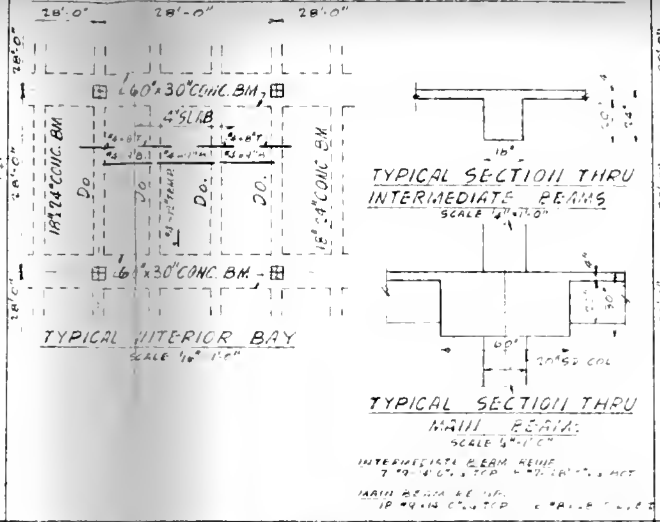
W. CHESTER BROWNE & ASSOCIATES, INC
ARCHITECTS ENGINEERS
22-128 ARLINGTON ST BOSTON

S-1 B.R.A. INDUSTRIAL DEVELOPMENT STUDY

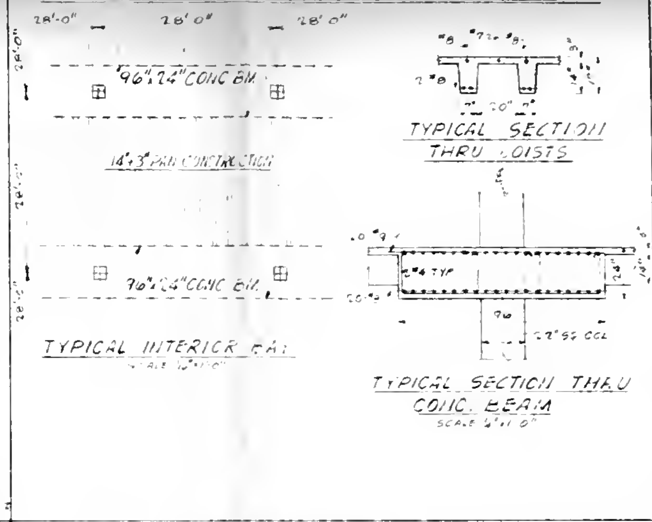
SCHEME #1-CONCRETE FLAT SLAB WITH DROP PANELS



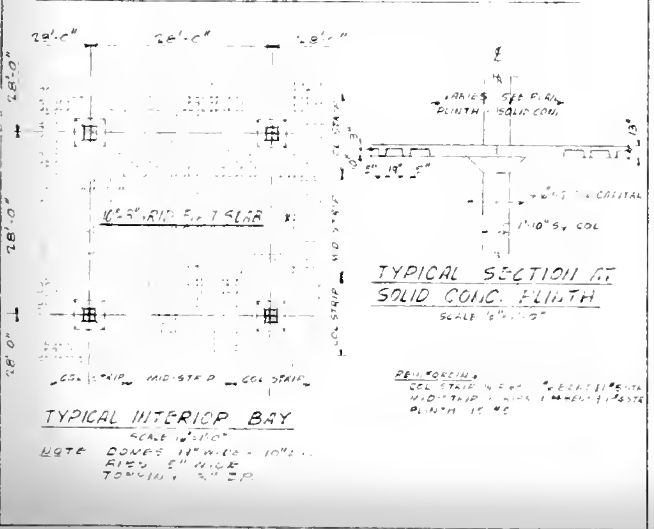
SCHEME #2 - CONCRETE BEAM AND SLAB



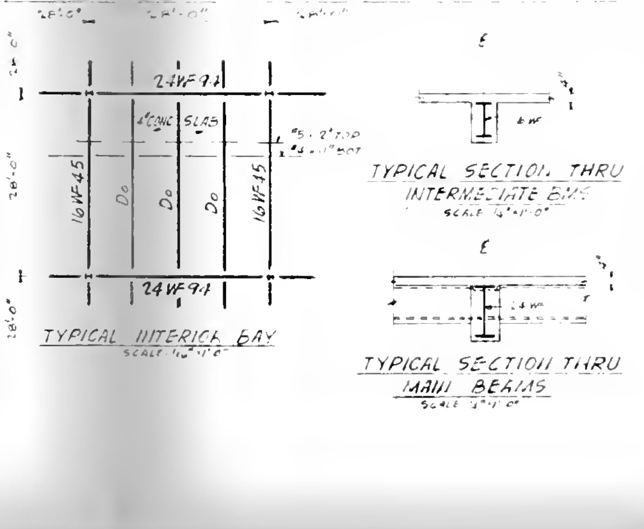
SCHEME #3 - CONCRETE JOIST AND BEAM



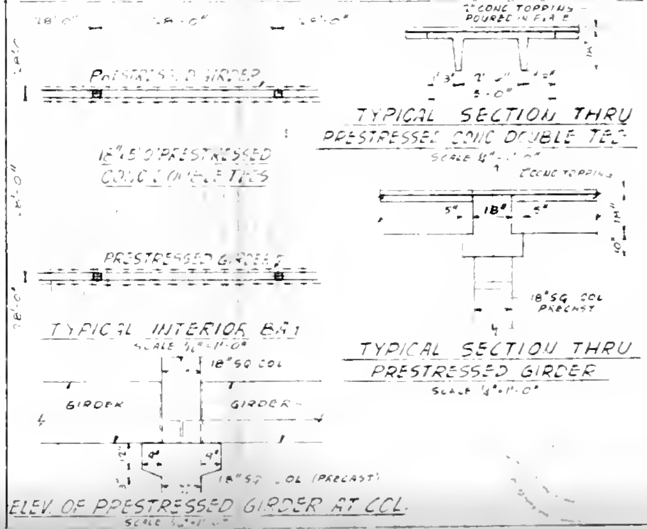
SCHEME #4 - 2 WAY GRID FLAT SLAB



SCHEME #5 - CONCRETE SLAB ON FIREPROOFED ST BEAMS



SCHEME #6 PRESTRESSED DOUBLE TEES ON PRESTRESSED GIRDERS



COST ESTIMATE

SCHEME #1

REINF	$0.75 P.S.F
CONCRETE	$0.60 P.S.F
FORMS	$0.68 P.S.F
TOTAL COST PER SQ FT.	$2.03

SCHEME #2

REINF	$0.80 P.S.F
CONCRETE	$0.79 P.S.F
FORMS	$1.26 P.S.F
TOTAL COST PER SQ FT	$2.85

SCHEME #3

REINF	$0.95 P.S.F
CONCRETE	$0.74 P.S.F
FORMS	$0.74 P.S.F
TOTAL COST PER SQ FT.	$2.43

SCHEME #4

REINF	$0.51 P.S.F
CONCRETE	$0.56 P.S.F
FORMS	$0.74 P.S.F
TOTAL COST PER SQ FT.	$1.81

SCHEME #5

STRUCTURAL STEEL	$1.20 P.S.F
REINF	$0.16 P.S.F
CONC.	$0.21 P.S.F
FORMS	$0.83 P.S.F
COLUMN	$0.29 P.S.F
TOTAL COST PER SQ FT.	$2.69

SCHEME #6

PRESTRESSED TEES	$1.50 P.S.F
CONC TOPPING	$0.25 P.S.F
PRESTRESSED GIRDER	$0.99 P.S.F
PRECAST COLUMN	$0.23 P.S.F
TOTAL COST PER SQ FT.	$2.97

NOTE ALL SCHEMES ARE BASED ON A LIVE LOAD OF 150 P.S.F

PROPOSED FRAMING SCHEMES FOR [illegible] BAY
B.R.A. [illegible] DEVELOPMENT STUDY
SOUTH END BOSTON

W. CHESTER BROWNE AND ASSOCIATES
ARCHITECTS ENGINEERS
ALBERT GOLDBERG AND ASSOCIATES
STRUCTURAL ENGINEERS

S-2 B.R.A. INDUSTRIAL DEVELOPMENT STUDY